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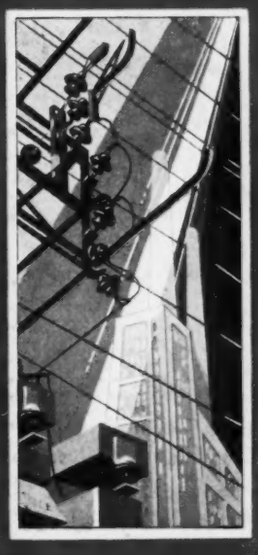
ELECTRICAL WORLD



¶ The electrical industry is emerging from a period of confusion and uncertainty unparalleled in our history. With increased costs and political disturbances — depression's aftermath — business, profits and even courage have been at a dangerously low ebb. Now the scene is changing. New social and economic thinking is being crystallized. A new service is being demanded.

¶ Electrical World stands solidly for the industry and assumes its full share of responsibility in providing this new service — in stimulating industry morale — in promoting industry leadership.

SEPTEMBER 1, 1934

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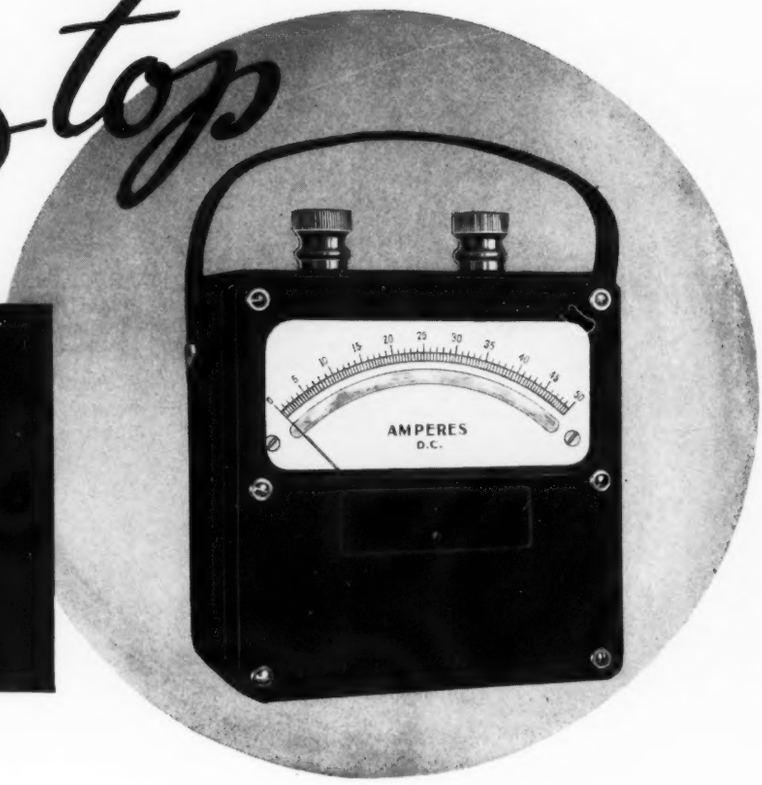
LOCATE and Stop

YOUR WASTED POWER



The accumulation of small, hidden losses from bearing friction, shaft misalignments, improper mesh of gears, tight or loose belts, etc., means an added burden to the cost of production. Likewise, overloaded or underloaded motors add their share of non-productive expense.

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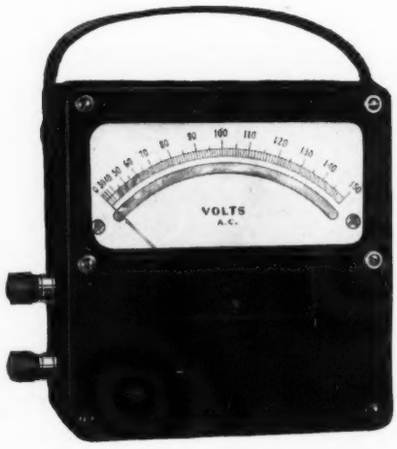

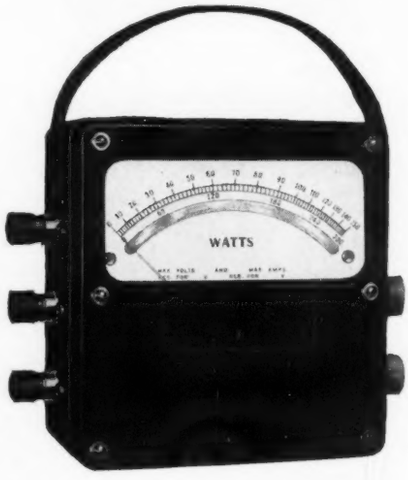

WESTON *Instruments*

ELECTRICAL WORLD

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR SIXTY YEARS

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Reader's Guide to This Issue

Of Executive Interest

	Page
Added capacity needed	281
McCarter discusses conditions	283
Operating a large system	292
Symposium on sales engineering and finance	294
Liversidge suggests action	296

For Power Company Engineers

Spending to save in maintenance	284
Novel transformer protection	287
Kehoe talks about engineering	295
Increasing transformer capacity	306
Metal spray saves condenser	308
Primary customer's manhole	311

On Power Company Sales

How industry electrifies	288
Load building increases	290
Quinn calls for sales	294
For service continuity	312
Ideas in luminous structures	312
Electric heat for glue	314

For Electrical Engineers in Industry

Non-inductive cable end-bell	318
Protection for Scott transformers	318
Motor-generator for meter tests	320
Electron tube tests commutators	320

For Electrical Manufacturers

Novel transformer protection	287
Load building increases	290
Quinn talks of sales	294
Increasing service continuity	312
Electric heat for steam-heated pots	314

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THIS INDEX is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

CONTENTS

SEPTEMBER 1, 1934

Utilities Must Add Capacity 281
Where We Are Going 283
Spending to Save in Maintenance 284
Novel Transformer Protection 287
How Industry Electrifies 288
Load Building Increases 290
Our Operating Problems 292
What Should Be Done 294
Liversidge Points the Way 296

News of the Week 298
Lead Loops Stop Vibration 306
Oil Cooling Increases Transformer Capacity 306
Saved $7,000 on Cable Crossing 308
Metal Spray Saves Condenser 308
Billings Rise After Checking Diversion 311
Primary Customer's Manholes 311
Luminous Structures 312
Current Control by Breaker Contacts 314
Non-inductive Cable End-Bell 318
Protection for Scott Transformer 318
Motor-generator for Meter Tests 320
Electron Tube Tests Commutators 320
Letters to Editor 338
Men of the Industry 344
New Equipment 346

VOLUME 104 . . . NUMBER 9

Contents Copyrighted, 1934, by McGraw-Hill Publishing Company, Inc.

ELECTRICAL WORLD—Published every other Saturday. Price 25 cents a copy. Subscription rates: United States, Mexico, Central and South American countries, $4 a year; Canada, including duty, $5 a year; all other countries, $6, or 24 shillings, a year. Entered as second-class matter, January 20, 1907, at Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Branch Offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, Aldwych, London, W.C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Greenville, S. C.

Printed by The Schweinler Press, N. Y.

McGRAW-HILL PUBLISHING COMPANY, INC.

330 West 42d Street, New York, N. Y.

JAMES H. McGRAW, Chairman of the Board

MALCOLM MUIR, President
JAMES H. McGRAW, JR., Vice-Pres. and Treas.
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Cable address: MCGRAWHILL, New York. Member A.B.P. Member A.B.C.

NRA
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GRAPHIC ARTS INDUSTRY
1934
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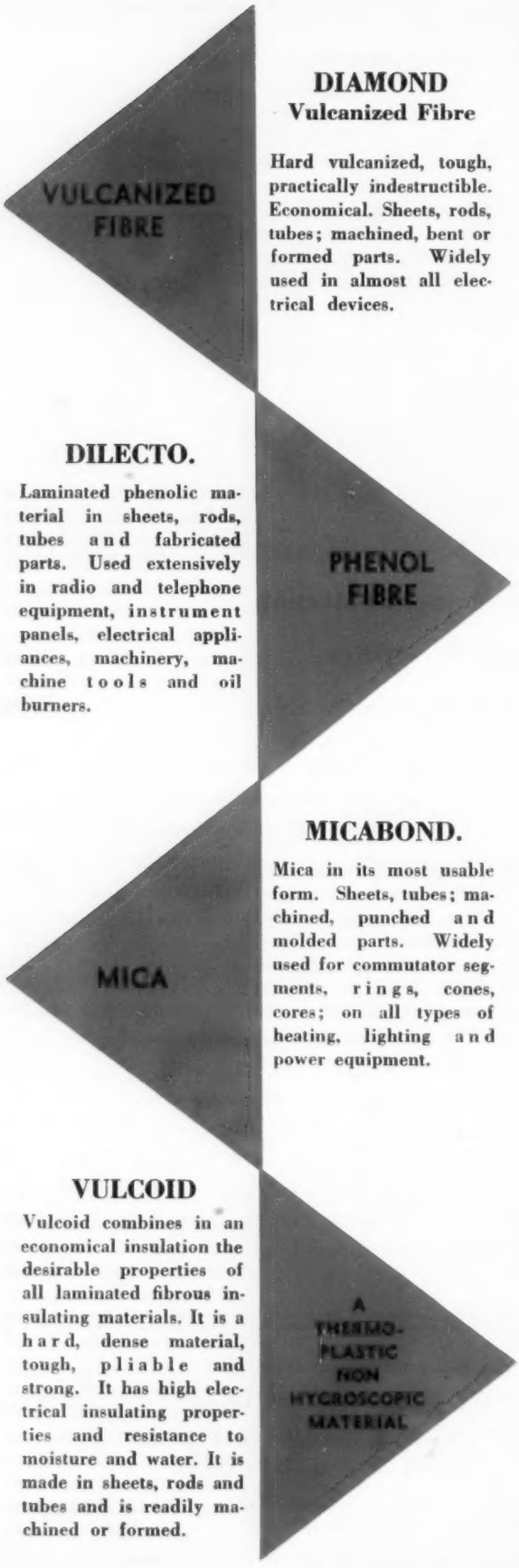
INSULATING MATERIALS



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ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

PUBLISHED EVERY OTHER SATURDAY

SEPTEMBER 1, 1934

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The New Electrical World

THE electrical industry has grown and prospered by departing from beaten paths. It has always been characterized by doing things differently and by contributing new things. Today it must follow similar roads to prosperity.

In 1882 electrical men brought forth telephony, telegraphy and electroplating. From 1882 to 1890 the arc light was developed and a host of engineers, inventors and manufacturers were busy with the incandescent lamp, the motor and the generator. Then from 1890 to 1915 utility service sprang into being through thousands of central stations in cities and towns. And from 1915 to date America electrified. The age of electricity arrived.

This expansion period stressed the ability of the industry to supply the public demand for electric service and electric devices. It had to build, to organize, to spend, to take orders at a rate that permitted relatively little attention to be given to such dominant problems as exist today—efficient operation, competition in sales, public regulation and government competition. It was running a race with demand.

ELECTRICAL WORLD helped to blaze this pathway for electrical progress. It led industry thought, promoted industry sales, developed understanding and co-operation and recorded and interpreted industry happenings. It prospered also because it served the industry competently and intelligently.

WITH this issue ELECTRICAL WORLD announces a new program developed to meet new industry conditions. It departs from the beaten paths to follow the industry. Beginning with this issue it will have a new style, more pages and improved contents. It will appear every other week. It is to be a 1934 model business paper, carefully and courageously planned to serve a 1934 industry.

For the electrical industry faces new conditions. It is now concerned with a planned expansion program; with more efficient operation of its facilities; with more effective and greater sales to markets already partly sold; with basic problems in finance and management inherent in such an enormous industry. It must sell its markets instead of supplying a public demand. It must build its additional facilities according to a plan that will bring maximum returns. It must perfect and consolidate its position. It must grow and can grow to a greater extent than has been recorded in the past. But this growth will be had in new ways and by the use of new methods. How to operate most efficiently, how to engineer for dollar economy, how to build and introduce new devices, how to sell on a promotional basis, how to make profits under new conditions in regulation and finance—these are today's and tomorrow's problems that must be solved.

UNDER its new publishing plan ELECTRICAL WORLD will contribute to the solution of these problems. It will render a better service to the industry. It will be better balanced, faster and more interesting in style, warmer and more intimate in personality and replete with significant and authoritative articles. It will be a planned product in keeping with the times. The editors will have more time to consider and select material, more time to study the field at first hand.

This new ELECTRICAL WORLD retains and improves upon all its established services. It adds new features. It will deal with personalties in larger measure. It will stress interpretation and contributions that aid in the solution of industry problems. It is designed to be more interesting to read and mightier in its influence for industry progress. This announcement is made after an intensive study of industry conditions and after consultation with industry leaders. It is a change which, if we do our part, you will welcome and approve.

CONCRETE RESULTS AT NORRIS DAM

Poised over the excavator at the East abutment on the Clinch River this six-yard bucket was ready at 9 a.m. on Tuesday, July 17, to drop the first concrete for Norris Dam. TVA has its battery of mixers on the other side of the river and the bucket rides a cable across.

Utilities Must Add Capacity

Load Growth Forces Station Building — Field Opinions on Time and Type of New Capacity — Effect of Fuel Prices — Possibilities for Modernization of Stations

THERE has been a vacation in station building, yet many opinions persist that an excess capacity exists in the utility industry. What are the facts?

Loads have come back to almost peak values. If we assume the conservative estimate that the last half of 1934 only equals the first half, the 1934 output of the utilities will be 86,000,000,000 kw.-hr. from 34,300,000 kw. of capacity. This output is only 6 per cent below the peak values of 1929.

But while there was a vacation in station building, there has been no vacation in sales of electrical equipment to the homes and to industry. Since 1929 these total sales have added an estimated connected load of 51,500,000 kw. to utility lines. This connected load, based upon a conservative correction factor for replacement, demand and diversity of ten to one, is equivalent to a demand of 5,150,000 kw. on utility generators. During this same period the added generating capacity has been only 4,750,000 kw.

Therefore, if the old load and the new load operate at normal value utility generating plants would be stressed to supply service. This effect has already been noticed on several properties. Some are now adding capacity, others are planning to add capacity and still others are viewing the future very carefully. If load holds up, there will be large additions of capacity needed in 1936 and 1937, and at least a year is needed to buy and install this new capacity. With the normal increase estimated and the average output per kilowatt used a total added capacity of 2,500,000 kw. will be needed for operations in 1936.

A national check

Another kilowatt method of analysis is provided by plotting the output and the capacity of the industry over a long period and then taking the ratio of capacity to output or output to capacity to strike averages and to indicate the normal margins. This has been done on the accompanying chart. It shows that utilities operated with very safe margins prior to 1914 and are now at about this same level. During the war and the boom the margins of reserve were lower and reached such a danger level in 1929 that large additions of capacity were made. Projecting these curves and ratios it is seen that, for the industry as a whole, the year 1936 will require the operation of a very large addition of generating capacity. Of course, this average check takes no account of individual properties, but it does serve to point to a general conclusion.

New generating capacity to be in operation in 1936 is estimated to be 2,500,000 kw. Engineers favor use of superimposed high-pressure stations and the building of relatively small stations at load centers as the next steps in power development. Government projects also add capacity, but do not affect total estimates because of their location. Several properties now at limit of capacity.

All checks on capacity indicate that negotiations for new stations will be on the increase in 1935 and 1936, because it takes from one to two years to buy and install new capacity. In fact, already several properties are adding capacity and others are negotiating for purchase or are planning definitely for additions within two or three years. Of course, this prediction presupposes continued load growth, and there is nothing on the horizon to say that this growth will not occur. Nor will the recently authorized government hydro projects affect the general situation appreciably, since these are not in the concentrated load areas already served by utilities.

It will be noted from the figures on energy sales that domestic sales have increased 36 per cent since 1929 and that wholesale power sales are still below 1929 levels by 14 per cent. Aggressive selling to homes is occurring to increase domestic sales still further, but the decisive factor on forcing an early installation of more generating capacity lies in the industrial load. If industry picks up to normal and demands energy quickly there will be insufficient capacity. Equipment manufacturers worry about this since this will force an abnormal demand for generating apparatus for immediate delivery.

What local engineers report

To investigate further the generating situation letters were sent to representative utilities. Questions were asked in regard to fuel prices, modernization of existing plants, present loads in per cent of capacity and expectations as to when additional capacity would be needed. A summary of these replies has been made.

The chief effect of recent changes in the fuel situation is to create uncertainty as to future prices and thus handicap the purchase of coal and oil on annual contracts. There has been an increase in the mine price of coal that has had an appreciable effect in some regions; in others decreased or changed freight rates have compensated for increased costs. Both coal and fuel oil contracts are now subject to clauses that will care for future changes in prices and are less specific.

In general, a very large increase in fuel price is necessary to justify the modernization or rebuilding of old stations. Fuel efficiency may be in-

creased 30 to 40 per cent in many instances, but this cannot be capitalized upon to make savings on investment charges of from $50 to $80 per kilowatt of capacity. Fuel price increase alone is not a lever to force modernization. To it must be added the need for more capacity and greater reliability. If a new station is needed, then high fuel prices may be capitalized upon to add, say, $5 to $10 per kilowatt in order to get maximum fuel efficiency. Several reports indicate that station remodeling will be started soon, because the increased price of fuel joined with increased loads to bring about this decision. Another significant item is the use and capacity factor at which a station operates. The nearer a station approaches full-use operation the greater the opportunity to capitalize upon fuel savings.

The large majority of utility engineers state that the best way to add capacity is to superimpose a high-pressure unit upon existing low-pressure equipment. A few state that it is better and cheaper to tear out old equipment and replace with 600-lb., 825-deg. units. Only two suggest the use of mercury units as superimposed devices to get capacity, the remainder being skeptical as to cost and reliability in comparison with other methods.

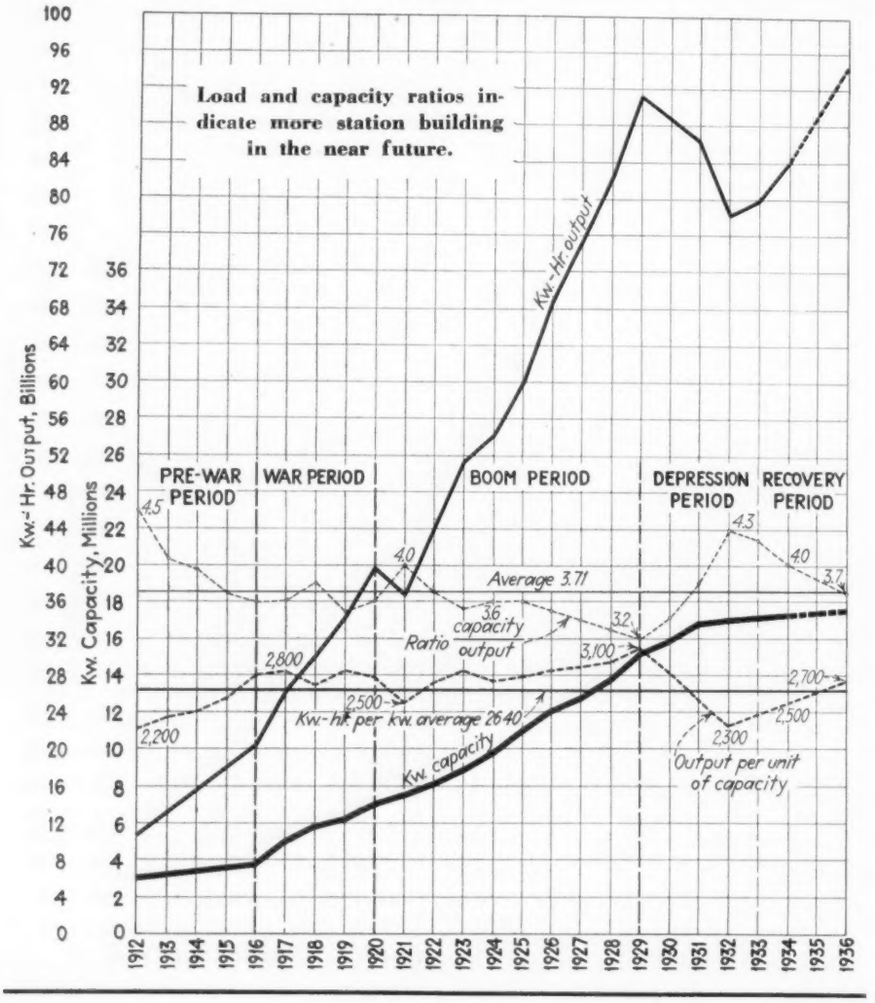
It is unsafe to generalize on station modernization. In some cases where existing equipment has only a few remaining years of life it is uneconomical to superimpose a high-pressure unit as a temporary expedient. In other cases remodeling can be done by changing boilers and fuel-burning equipment to get most results for least expenditures. Sometimes the water and fuel available handicap the use of superimposed high-pressure units. Each case of station modernization is a matter of open-minded economic analysis. Yet the prevailing opinion favors the use of a superimposed 1,200-lb., 900-deg. unit as the general method of approach.

Table I—Classified Output Changes Since 1929

	1929	1930	1931	1932	1933	1934	Per Cent Change from 1929
			Millions of Kw.-Hr.				
Domestic	9,773	11,018	11,738	11,790	11,900	13,100	+36
Retail	13,106	13,944	13,544	12,900	12,400	13,300	+ 1.5
Wholesale	44,326	41,621	38,451	31,000	33,700	38,000	—14.0
Municipal	2,450	2,735	2,994	2,950	2,200	2,600	+ 6.1
Total sales	69,655	69,318	66,727	58,640	60,200	67,000	— 3.8
Generator rating	29,558	31,976	33,483	33,977	34,100	34,300	+16.3
Total output	91,400	89,900	86,300	77,800	79,800	85,800	— 6.1
Use factor	35.0	32.0	29.5	26.1	26.7	28.6	—18.2

Table II—Equipment Sales Since 1929

	1930	1931	1932	1933	1934	Total
			Quantities are in Millions			
Total sales	$1,200	$995	$635	$750	$1,000	$6,780
Estimated kw. connected						
Industrial	10.0	7.0	4.0	6.0	7.0	34.0
Domestic	4.2	3.4	2.7	3.2	4.0	17.5
Total	14.2	10.4	6.7	9.2	11.0	51.5
Increment kw. demand, based upon 10 to 1 ratio	1.42	1.04	0.67	0.92	1.1	5.15
Added generator rating since 1929, kw	....	....	....	....	....	4.75



For the new stations

Differences of opinion exist as to the type of equipment to be used in new capacity additions. One school of thought favors 1,200-lb., 900-deg. units without reheat. Another is equally strong for 600-lb., 825-deg. plants. Still another group hopes for 1,000-deg. temperature and corresponding pressure stations. All favor the unit type station with single boiler-turbine and auxiliaries.

On the majority of properties new capacity will be added by building extensions to existing stations. One or two will tear out equipment in existing stations and replace with modern apparatus. Three or four say that several relatively small stations will be built at load centers in preference

[*Continued on page 76*]

Where We Are Going

Attacks on Utilities Will Pass — Aggressive Defense Suggested — Money Available for Expansion — Suggestions for E.E.I. Work

THE new president of the Edison Electric Institute is Thomas N. McCarter, a man long and favorably known as an outstanding leader in the industry. His opinions about present industry conditions are competent and are of the greatest interest to all electrical men. He has a firm faith in the future of the industry. When interviewed by the editor of ELECTRICAL WORLD he spoke frankly and freely about industry problems and made suggestions for their solution.

"Do you believe the private utility industry will be destroyed by the present attacks and the new government competition?" This was a leading question with a vengeance.

"Most decidedly not," replied Mr. McCarter. "I have confidence in the intelligence of the American people and many things now occurring will not become the settled policy of this country. We are living in a day that is surcharged with hysteria. One form that it takes is an attack upon the light and power industry and the fundamental reason seems to be because it has been reasonably prosperous. Yet I have a firm belief that the American people will not be led by this hysteria to take such radical action as to destroy the established method of the operation of public utilities. No one objects to proper regulation of utilities. All of the enlightened utilities of the country have not only acquiesced in but co-operated with it. But now the radical appetite must be satisfied by adding over-regulation and other destructive economic factors in order to destroy the utility industry as a going concern. This should not be permitted and will not be permitted because it is not in the public interest.

"And most of the excitement is about domestic consumers and domestic rates. Now, on the Public Service system, for example, there are 690,000 domestic consumers and the average monthly bill each pays is $2.80!

THOMAS N. McCARTER
President Edison Electric Institute

Less than 10 cents a day; less than the average smoker pays for a package of cigarettes or a cigar; less than the price of a large loaf of bread; less than half the price of a ticket to the movies. One would think, from the shouting that goes on about it, that the public was being mulcted out of a large portion of its income by a grasping monopoly and that the payments made constituted a very substantial part of the family budget. This agitation, in the light of the facts, is nothing but artificially stimulated buncombe. The utilities, as a part of their business, lower rates and build business as rapidly as reasonable earnings permit. Their record in this matter is available. The present agitation is much ado about very little and is not justified by the facts."

"But what should the utility do to improve this situation? This agitation and government competition is here and is a problem to be dealt with." And this question touched the heart of the present utility problem.

"The answer to your question involves the attitude of the industry," replied Mr. McCarter. "My own opinion is that, from now on, the industry should be aggressive in its own defense by the use of all legitimate and proper means. It should, of course, wholly avoid any course of action that does not meet this test.

"I think that the utilities locally and the national organization representing them should from now on, in a dignified but forceful way, do everything possible to foster public sentiment. Locally, this should be done by advertising, by contacts of officers of companies with the public they serve, by the most scrupulous business conduct and by constantly reiterating to the public served the great fundamental truths upon which the problem rests. The Edison Electric Institute has appointed a special committee to consider the future activity of that body as representative of the industry in dealing with national aspects of the problem."

"Under present conditions, what do you think of the soundness of utility investments and will the industry be able to finance its expansion programs?"

This question has arisen so frequently that the opinion of Mr. McCarter was sought.

"I do not think there is any valid reason for considering utility securities of the proper sort unsound investments at this time, although I am not surprised that public opinion toward them is timid in view of governmental action in the Tennessee Valley and Columbia River basin," replied Mr. McCarter. "The effect of this policy, if extended throughout the country, upon the investments already made in public utilities and the future of the industry would be disastrous. But I do not think this policy will be continued.

"Financing in future by the public utilities depends upon public sentiment. The securities act will, in my opinion, impair but not destroy the ability of companies to finance in the

[*Continued on page 74*]

Spend to Save in Maintenance

Case Studies Prove Expenditures for Adequate Maintenance Pay Dividends or Improve Service

Dislocation of habitual programs of activity have been contributing distinct benefits to electric utilities because, with expansion marking time, the pressure has been put on things that formerly escaped notice. In few places have systems been allowed to run down at the heels. Staffs have remained available to simplify, improve, fortify, revamp and relocate. Out of this abnormal era are coming new practices and new devices that will profoundly influence the equipment and the technique of the revived expansion period that is awaited everywhere by electric utilities and manufacturers

NOT only has curtailed output and revenue forced attention to little matters of detail in operation and maintenance, but there have been other factors working in the same direction. Even the prolonged drought has contributed problems and solutions in some quarters. An epidemic of lubricating oil fires made station people thoughtful about technique. With the utility in the public eye continuity of service has become more prominent than ever—some think more prominent than the economic balance warrants. Slow but steady increments of range and water heating loads have forced revamping of distribution capacity. A wave of diversion of energy necessitated stringent measures in metering to combat it. New forms of splices in cables, especially the Y type, are being perfected. Connectors are displacing soldered joints in distribution practice.

All in all, the recent era has been unusually prolific in developing more lasting and more economical ways of doing things, and these will have a certain influence on system design and system operation in the immediate future. Some companies have done relatively little along this line, not because they did not have the desire or the ingenuity, but because it was more necessary to keep men at work than to devise methods which often would reduce the labor item. As conditions improve these companies will adopt and improve upon what the others have done. Manufacturers, too, are alert to incorporate these utility-originated devices and methods into their products.

To make accomplishments in maintenance and operation as significant as possible it appears most fruitful to cite in connected manner what a single utility has done throughout its operating departments. This will be the Toledo Edison Company and the citations are culled from reports made by G. W. McIver, chief engineer, and H. H. Kerr, superintendent of the operating department, to Lawrence Bartlett and Howard Lawrence, chief electrical and mechanical engineer, respectively, of H. L. Doherty & Company, the parent organization. The Toledo company has extended its efforts over the whole gamut of operations from coal pile to meter, and some of these will be detailed here to show how economies can be effected to keep costs down without endangering service or response to demand.

Experience with the secondary RAM DRIVE ARM of the stokers at Acme station had not been good. The original design was such that breakage of the arm and wear on the bearings were more than should have been the case. A new design was made which brought the member throughout more in line with the force and motion of the arm (Fig. 1). The result has been an elimination of breakage and a reduction in bearing wear. In addition, the amount of coal which has sifted out of the boxes has been much reduced.

Changes in the LINERS were made at the same time as above. Formerly liners were purchased from the manufacturer at about $16 each. Now 9-in. pipe is bought, split in halves, machined on the three bearing surfaces outside at a total cost of a little more than $6. Such have been in use two years, giving highly satisfactory service.

Besides the high maintenance on the preheated air stokers ash was burning to the iron and capping the tuyères.

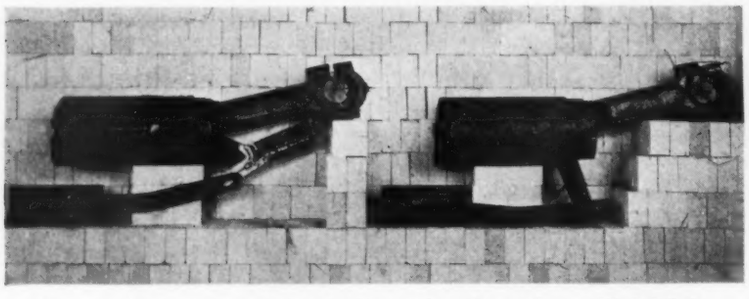


Fig. 1—New ram arm less liable to breakage than old (right)

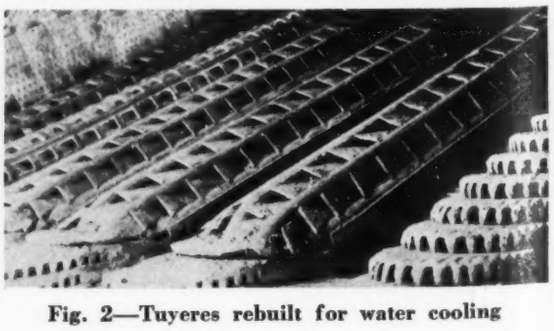
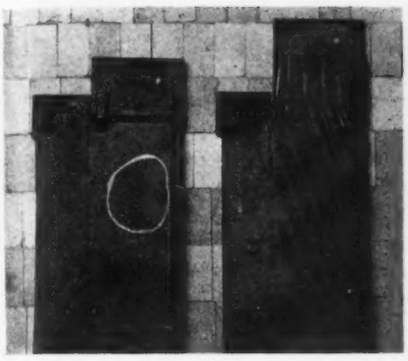
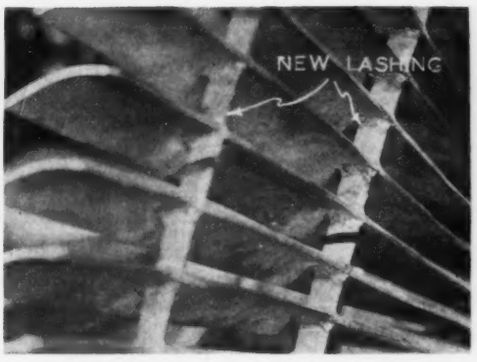
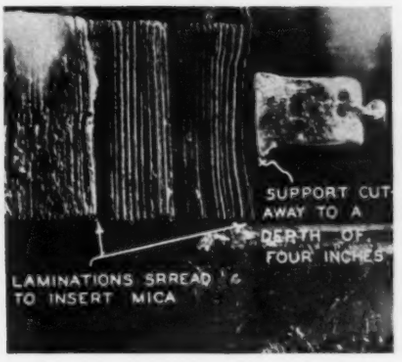


Fig. 2—Tuyeres rebuilt for water cooling







Figs. 3, 4 and 5—Ribs keep retort plates from burning through, welded-in lashing lengthens turbine blade life, hot spots eliminated without dismantling and restacking laminations

Something had to be done, so WATER-COOLED TUYERES were designed and installed (Fig. 2) on half the stoker. Condensate is circulated through the cooling elements, but it is planned to place this in the boiler circulation. After a year's trial the results have been highly satisfactory, even burning low-fusion ash coals. Also of interest is the ability to burn low-fusion ash coals on the water-cooled side and regular high-fusion ash coal on the other simultaneously, and up to the maximum ratings.

Trouble had been experienced by the occasional burning through of the SIDE PLATES on the retorts. It was believed that this could be remedied by affording more cooling area to the outer surfaces of the plates. This was effected by casting new plates with oblique ribs (Fig. 3) and the trouble has been practically eliminated. Bottom plates were subsequently treated the same way.

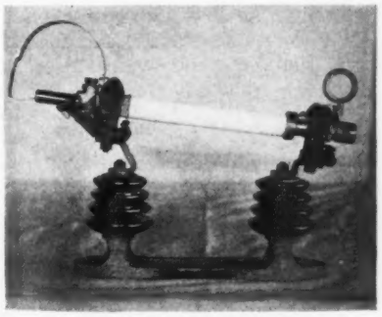


Fig. 7—"Gadget" converts underslung fused switch to give indication of blowing

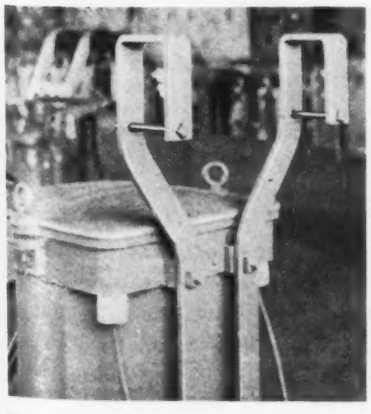


Fig. 8—Transformer hanger defies auto bumps

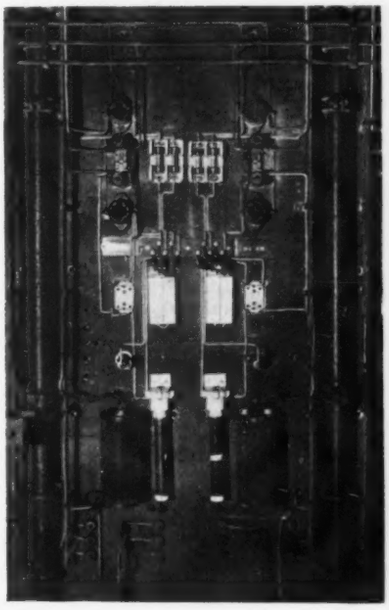


Fig. 6—Instantaneous reclosing breakers locally designed for manually operated substation

The main generating plant's coal handling and storage facilities include a GANTRY CRANE. Extension of its track offered a saving in handling of coal stored in this space under that stored in the regular yard of 20 cents per ton. Coal handling savings alone during the past year amounted to about $5,400.

Coincident with the growth of this need was the disposal problem of no-longer salable cinders, and a great deal of spare time of necessary workmen. So, three problems were dovetailed into a solution. Concrete cribbing was cast on idle time and stacked in place. Cinders which required hauling away to the dump instead were dumped on the cribbing, and then the track extension laid.

Toledo's main plant is designed to burn high-fusion ash coal, mostly from West Virginia. Between this and Ohio coals there is a freight differential of 50 cents per ton. During this depression this challenged the ingenuity of the plant's personnel and the following resulted:

With minor CHANGES IN THE STOKERS (not the water-cooled tuy-

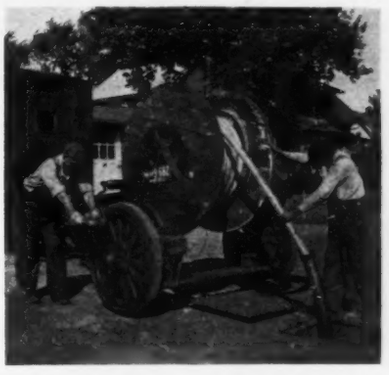


Fig. 9—Two men reel cable with this windlass

Fig. 10—Spacers precast for duct runs

ères), these operators now burn the relatively low-fusion ash Ohio coals during periods of rather continuous lower loads, taking the rather high short duration peaks satisfactorily. Over-all savings from this practice run between $50,000 and $70,000 per year.

Improvements made on turbines

Three things done in the turbine room may be cited. Wire lashing of the turbine blading was replaced by the new Westinghouse design of BLADE LASHING. This (Fig. 4) has three times the cross-section of the old and is consequently more rugged. Nevertheless, it offers less resistance to steam flow. Further than that, it does not pass through the blades to weaken them, a section of the lashing being welded between blades. It has been found that this lengthens the blade life by reducing the vibration to which the blades are subject.

As a TURBINE TURNING GEAR was being installed the plant engineers saw the desirability of a free-wheeling element with it. So, in collaboration with the manufacturer, such was installed, permitting engaging and disengaging the mechanism with the gear wheel on the turbine without stripping the teeth owing to the difference in speeds.

An interesting repair problem and solution is now presented. Small hot spots of serious implications showed up in a finger of LAMINATIONS in a 35,000-kw. generator. The usual procedure in repairing would have required partial dismantling and restacking of the laminations. Instead of this, however, the laminations were separated, the hot spots ground out with locally designed portable tools and mica strips inserted (Fig. 5). The repairs have proved satisfactory and their cost was only a fraction of that required by the regular procedure.

Fires from flaming oil are still somewhat of a hazard in substations, especially those which contain equipment which antedate the latest efforts to control this hazard. In one of the Toledo substations there were banks of 45,000-kva. and 15,000-kva. transformers in close proximity and devoted to distinct elements of load. In order to protect each of these against possible failure of the other bank a steel FLAME BARRIER was installed between the two banks. It is believed that this will effectually prevent spread of flaming oil from one to the other of the two banks.

Cleaning the cooling coils of transformers does not always remove the accumulated scale and sediment unless the cleaning compound is applied long enough and thoroughly enough. A CIRCULATING PUMP was rigged up on a factory truck and the cleaning of the cooling coils is accomplished more completely and expeditiously now that the cleaning solution is circulated many times through the pipes.

In the absence of a supervisory system it was generally necessary for the dispatcher to send a troubleman to find out which breaker had opened under fault or overload. This is no longer necessary because a recent installation of an adjunct to the SUPERVISORY SYSTEM permits each breaker to transmit a distinguishing code signal to the dispatcher's office. This signal is recorded on a printing register in that office. Also, the important transmission feeder circuit breakers have been equipped to allow the load dispatcher to operate them from his central position, using the existing signal circuits. Of further interest than that service can be restored more quickly by using this equipment is that the local men design and install it for about $150 per substation, as against the manufacturer's price of equivalent equipment of about $1,200.

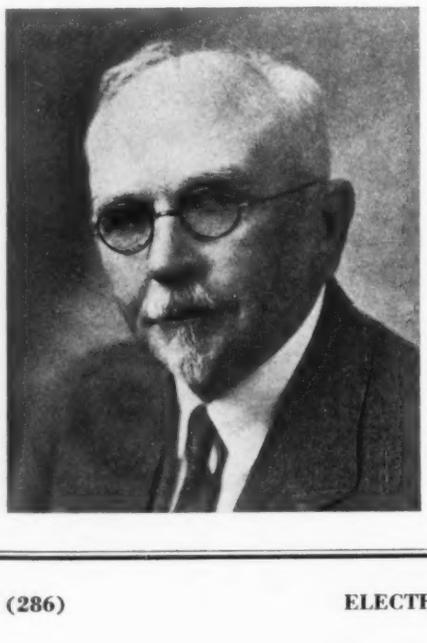
Make breakers reclosing

With a similar thought in mind the substation men have equipped the manually operated substation breakers for INSTANTANEOUS RECLOSING. They assemble the necessary equipment from standard mass-production elements and install it at a total cost of about $15 per feeder (Fig. 6). This performs very satisfactorily, reclosing once in about 40 cycles before the motor load is dropped.

To restore service on a feeder on which the oil circuit breaker has locked out the feeder branches are opened at the load center point. Pilot

[*Continued on page 64*]

TAXES — By F. T. POST, President Washington Water Power Company



IT IS A FACT which seems not to be very well appreciated by officeholders, who spend the taxpayers' money, and perhaps not very well appreciated by the public generally, that the interest of the investor and the consumer is practically the same. They are quasi-partners. The consumer desires to have from a public utility the best possible service that can be obtained and at reasonable rates. First-class service cannot be given by any public utility unless the investor is permitted to have a reasonable profit upon his investment. If through taxation, or otherwise, the investor is deprived of a reasonable profit, the public utility plant will not be developed and properly maintained and the service will be impaired. And there is another principle that cannot be set aside or affected by tax legislation; viz., the utility gets its money with which to pay taxes from its customers and excessive taxes eventually must be reflected in its rates.

Novel Transformer Protection

Uses Sphere Gaps in Series With High-Voltage Fuses on High Side, Arresters on Low

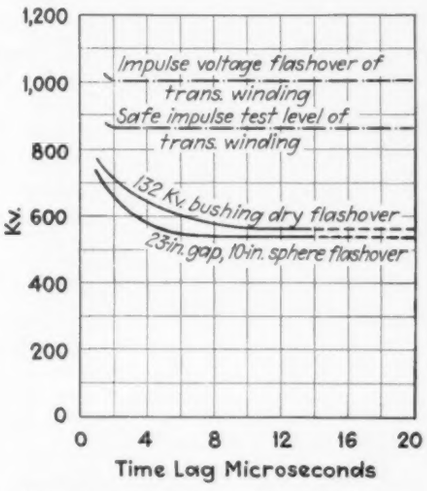
By H. A. P. LANGSTAFF
Electrical Engineer
West Penn Power Company

THE West Penn Power Company has completed a modern and economical type of lightning protection on 33 large power transformers. The application consists of sphere gaps connected in series with high-voltage fuses mounted directly on each transformer on the 132-kv. side and the installation of 20-kv. line type arresters on the 25-kv. side of the transformers.

This additional protection was made necessary because of several transformer failures when protected only by station type arresters on the 132-kv., 66-kv. and 25-kv. outgoing and incoming lines. At six of the high-capacity transformer stations the 132-kv. arresters, with the exception of one electrolytic type, were reduced from 100 per cent to 80 per cent arrester rating during the past three years. This rating is based upon the ratio of apparatus insulation tests: Grounded neutral service, 2.73 times rated phase voltage plus 1,000, compared to ungrounded neutral service as 100 per cent, twice rated voltage plus 1,000. At the substation the transformers are connected delta-star, 132 kv. to 25 kv. The banks vary in size from three 5,000-kva. to three 10,000-kva. single-phase units. The 25 kv. is grounded through 18 ohms resistance.

Sphere gaps used on the new protection consist of two 10-in. aluminum semi-spheres, one mounted directly on the upper end of the 132-kv. bushing and the other on the upper end of a specially designed tubular holder or bracket supporting the 73-kv., 5-amp. expulsion type fuse. Maintenance costs have been negligible and all parts are readily visible and easily inspected. Accompanying illustrations show the detail mounting of the sphere gap and fuse holder and a general view of a typical installation.

Transformers with three windings, 132, 66 and 11 kv., are equipped with sphere gap and fuse protection on the 132-kv. and 66-kv. sides. The sphere gaps on the 132 kv. are set from 18 in. to 26 in., depending upon the transformer insulation. The 25-kv. transformer winding is protected by a 20-kv. line type arrester.



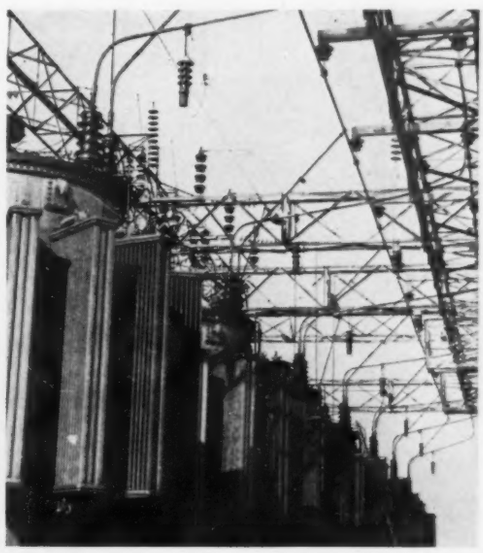
Impulse flashover values of sphere gap bushing and transformer insulation for 1.5-40 m.s. surge

Impulse flashover values are given for the 23-in. sphere gap, bushing and transformer insulation. These values indicate the co-ordination of the equipment and the gap. The values given are not test values; they are taken from published curves,* but are believed to be sufficiently accurate for comparison.

Although this shows the relative surge flashover values of transformer insulation, bushing and gap, the surge, of course, is expected to discharge through the arrester and the gap to act only as a second defense should the arrester fail to operate. The unit cost of the sphere gap installation is $75 per transformer, including material, labor, engineering and overhead.

All these installations have been in service for several months, but to date no flashovers have occurred nor have we experienced any transformer failures.

*"High-Voltage Surge Tests on Standard Air Gaps," F. D. Fielder, *Electric Journal*, 1932. "Flashover Characteristics of Insulating Structures," C. L. Fortescue, *Electric Journal*, 1930. "Making a Transformer Surge Proof," P. L. Bellaschi, *Electric Journal*, 1933.



Left—Sphere gap and expulsion fuse installed on transformer bushing, 132-kv. side. Right—Line type arrester installed on 25-kv. side of transformer

How Industry Electrifies

Reorganizations, Markets Defined, New Uses Being Uncovered—More Comprehensive, Better Co-ordinated Programs

Industrial and secondarily commercial developments have been subordinated to domestic electrification for four years. This coming year they will be given a more prominent position in most programs as conditions seem more propitious. These plans and methods gleaned from six management groups and fourteen prominent operating companies should inspire and aid all companies, including manufacturers, in programs for beating rising costs and increasing net revenue.

A HEALTHIER atmosphere for power sales achievement is being created. As one noted sales manager has said: "Last summer (1933) we came to the conclusion that it is practically impossible further to reduce operating expenses, and with new legislation in full swing our tax burden and operating expenses will be materially increased. Increase of revenue is the only salvation, but it is neither wise nor practical to increase rates. We must energetically pursue various sales activities and to this end add salesmen."

Reorganizing Sales Staffs—Revisions in organization are proceeding as fast as possible on the basis that they are *not* selling equipment nor power but usage. The head of each commercial group in a company is instructed that he will be responsible for the best return on the money expended for sales effort and that he is expected to sell all uses in his group and not ride hobbies. The sales managers are likewise instructed except that they must embrace all classes of business under them.

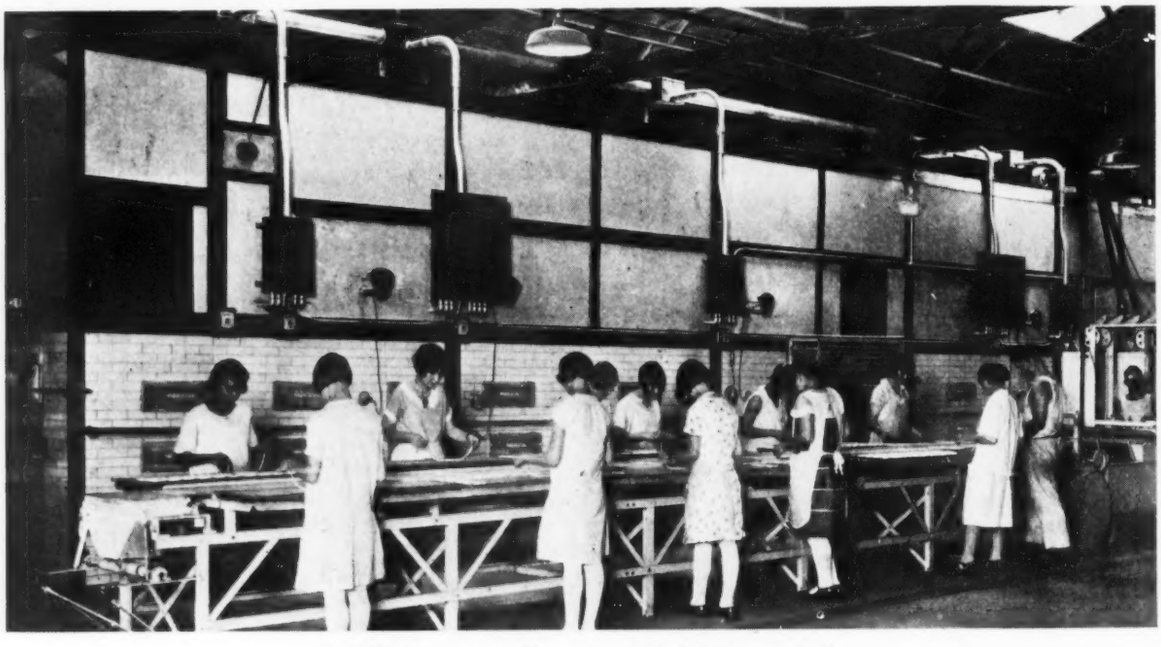
Commercial functions are being divided by group A companies* into five groups: (1) lighting, (2) refrigeration, (3) air conditioning and ventilation, (4) bread baking and commercial cooking, and (5) motive power.

Industrial functions involve defensive and offensive (not obnoxious) methods. For the first, contacts and service must be such as to develop confidence of customers. For the offensive approach the requirement is to define markets and new applications, campaign methods, quotas and budgets.

There will now be one contact between utility and each customer who will be instructed to sell all uses. No specialists will contact the customer independently, but will be available on call of the customer-contact salesmen.

Payment of salesmen is being converted as fast as possible to an inducement basis, with just enough flat salary to insure proper attention to existing

*Some comments could not have been included if identified, so all practices are keyed to permit co-ordination of practices.



A 152-kw. traveling oven baking pretzels

This industry, which is bigger than realized, is electrically minded. Wherever heat is used and a uniformly controlled temperature is demanded production economies and operating advantages are available to other industries which adopt electric heat.

customers and a commission based on the estimated annual revenue of added business.

Either the general manager or the power sales manager must have been a good power salesman formerly or business acquisition will suffer by lack of proper supervision and co-ordination. The ideal situation is to have both men experienced in this line.

Additional Salesmen—Organization without adequate personnel and advertising is a feeble thing. The spirit and action of the vice-president in charge of sales for company F should be an example to other executives who have let the fear complex master them or their superiors. He said this spring:

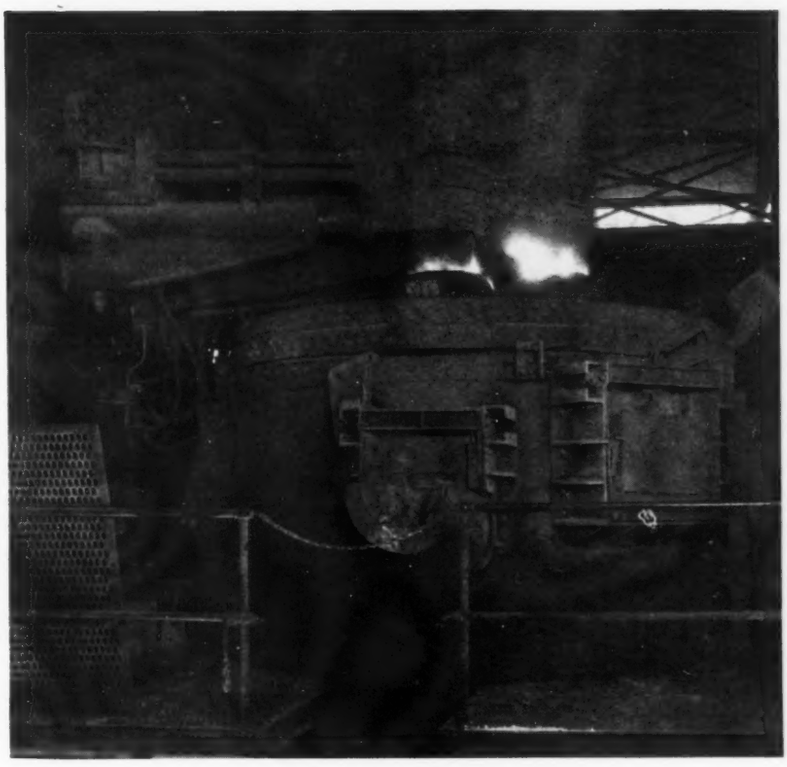
"As the depression proceeded we increased sales effort rather than diminished it. If at any time it looks as though some additional money spent on some specific project might produce satisfactory results, I do not think we would hesitate to increase the expenditures now budgeted."

Added salesmen were recently put on lighting by group D, bringing the total 72 per cent above the staff of 1933. These were added primarily to enable pursuit of customer surveys which are so helpful in securing added business. To stimulate further the use of midget heating devices in industry, this same group added salesmen to follow up direct-by-mail advertising. Company U will spend more than $1,000,000 in strictly sales effort this year to secure $3,000,000 additional business, only half of which will appear on this year's revenue.

These are just a few challenges to the wary.

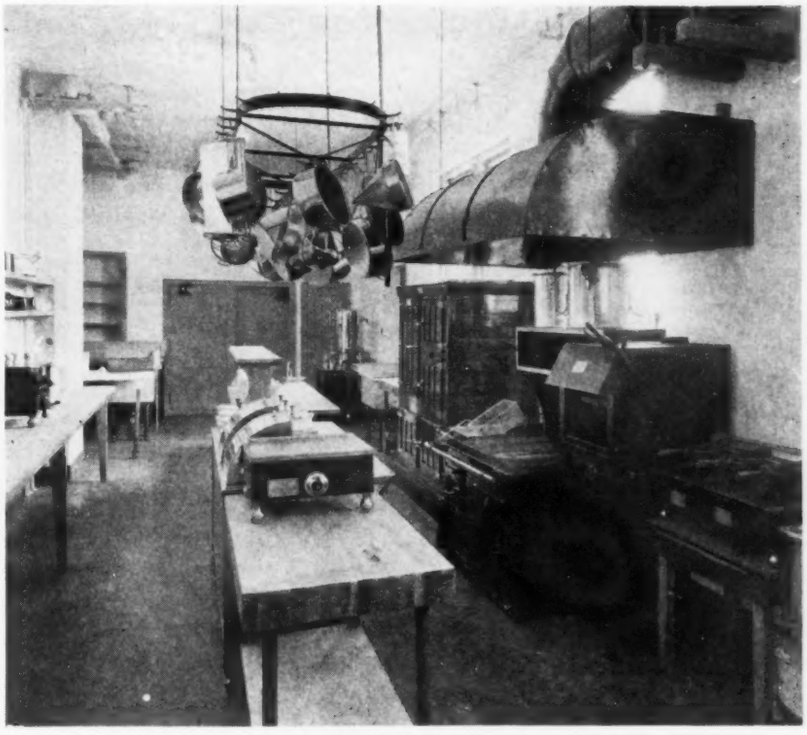
Comprehensive Programs and Budgets—With an adequately manned, properly organized staff, a balanced comprehensive program that embodies a budget is imperative. It should list large commercial and industrial prospects ($5,000 estimated annual revenue and larger), list everything they can profitably use, number of salesmen required to do the work, amounts of money utility and customer must spend, and the estimated annual revenue. It may be impossible to follow the program in detail, and departures will be made. But it establishes a goal and the most direct path, according to group A, which enables the most direct approach to the goal even if diversions are made.

[*Continued on page 66*]



An 1,800-kw. arc-melting furnace

Metal melting with electric heat is growing wherever the control of quality, ability to use neutral atmospheres and other advantages are shown; melting of gray iron is extensive, and is increasing with special rates. Non-ferrous metal melting and various forms of heat-treating offer other industrial applications.



A 100 per cent commercial electric kitchen

It may not appear so on the face, but 63 kw. in electric units are in this kitchen. What a load for this small kitchen! Others are electrifying as proof of advantages spread. In this kitchen are the following electric devices: Range, broiler, fry kettle, waffle iron, toaster, griddle, steam table, coffee urn, cup warmer, baking and roasting oven, dishwasher, ice cream cabinet and three refrigerators.

Load Building Increases

An Analysis of the Sales Activities of 100 Selected Power Companies — A Comparison of Policies and Plans and Results With 1933

EVERYBODY in the power industry is interested right now in sales possibilities. Since there is no better way to reckon them, a study has just been made of the accomplishments of the first half of this year. The analysis embraces 74 reports, covering about 100 companies, serving some 10,000,000 consumers, or about half the connected customers of the industry.

These companies were selected to give a national distribution and a good cross-section of the industry. The comparisons of the first six months of this year with the like period of 1933 gives an interesting indication of the increasing sales activity of the power companies and the direction they are trending.

The story is told most easily in the accompanying tabulation. That there has been a general increase in the number of appliances sold this year was to be expected. Times are improving. The utilities have been stimulated by the threat of government competition to fresh activity in selling. And the figures reflect how general this is. But it is impressive to see one company increase its refrigerator sales by 600 per cent over the previous year and another 300 per cent and two more 250 per cent, and so on. It is striking to note one company increase its range sales 900 per cent, two companies 500 per cent, two 400 per cent, three 350 per cent, and so on; to see 39 companies increase their sales of water heaters, 37 their sales of clothes washers, 35 their sales of ironing machines and 40 market more small appliances.

In a word, the increase holds right down the line, more salesmen, more home demonstrators, more money spent for advertising, more lighting installations, more power installations, more appliances sold in all classes. The general conclusion is that these companies pulled in their belts and went to work, and the wonder is why the others did not do the same—under the conditions.

Allowance must be made in these comparisons in that some companies, answering the same questions, making the same report, may have done so incompletely. This fact only affects the relation of some of the column totals in this tabulation, however, where certain figures have not been furnished. The statements on activities, policies and plans stand for themselves and are in spots amazing. For example, 22 companies do not report participation in the Better Light-Better Sight campaign, though six of these say that they are now planning for a fall program. Lighting work was general, however, with 70 salesmen and 31 home service women added to the lighting staffs during the first half of this year, while 34 companies featured customer surveys with sight-meter kits. Only nine mention direct mail advertising to support lighting, twelve had no activity in commercial lighting and 35 no drive for industrial lighting. Only nine companies tried to develop highway lighting.

Selling now centers in the kitchen seeking growth of load

Likewise, work in the power field was at a low ebb. Only 44 companies, apparently, were actively working to stimulate industrial load, which is surprising in light of the present importance of factory modernization, slow as the manufacturer may be to act. Boiled down, eleven power salesmen were added by these companies, 26 kept up their steady contact, ten used direct mail advertising, three reduced rates as a stimulus, one tried trial installations, three worked co-operative dealer programs, directed at the factory, three companies made isolated plant surveys, three speak of defensive work to hold the customers against the lure of a private plant. One says: "We have our lighting specialist work on it." Another says: "No special effort applied this year."

Campaigns in domestic appliances were naturally more popular, because they offered better chances for results. Among them we find—42 companies campaigned on refrigerators, 41 on ranges, 38 on water heaters, fourteen on clothes washers, fourteen on ironing machines, four on cleaners, nine on flatirons, twelve on small appliances and eighteen on individual small appliances, including one on radio, three on fans and two on attic ventilation, while seven held general employee drives on appliance lines. The impressive point is, how many companies are content to campaign on a few appliances and how few drive forward on all with a balanced program. One company reports: "We held a range campaign and no other special activity." Another says: "Standard selling activities only—no trick stuff."

There is an interesting reflection of the growth of dealer co-operation in these statements. Only fifteen com-

[*Continued on page 71*]

Analysis of Power Company Sales

Comparison of first half year—1934 and 1933—embracing companies serving an aggregate of 10,033,422 customers

Company	Refrigerators Units Sold		Ranges Units Sold		Water Heaters Units Sold		Clothes Washers Units Sold		Ironing Machines Units Sold		Flatirons & Small Appliances Units Sold		Lighting Installations Units Sold		Power Installations Units Sold		Advertising Expenditures	
	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933
1	300	150	402	90	57	20	Don't Mdse.		Don't Mdse.		Don't Mdse.		.....	.....	1,080 kw.	1,075 kw.	$3,500	$1,733
2	40	40	0	0	0	0	70	70	10	10	200	120	20	.....	0	0	1,200	1,000
3	1,252	1,039	283	.....	30	.....	0	.....	0	.....	0	.....	0	.....	.....	.....	(5% under 1933)	
4	3,580	3,505	0	0	0	0	2,267	1,528	644	260	50,580	48,413	5,369	1,609	633	485	261,126	259,121
5	2,532	1,769	473	228	295	97	1,089	1,102	89	96	1,219	1,368	187	160	25	.....	16,011	16,727
6	1,395	1,470	1,113	304	865	51	646	918	108	170	4,404	4,165	2,676	2,220	2,620	2,584	111,109	85,119
7	1,671	1,286	482	22	64	5	844	370	226	82	7,280	5,591	0	0	183	45	38,769	15,162
8	3,524	2,076	1,416	183	662	37	504	75	185	17	14,718	8,912	4,251	2,071	10,694 kw.	6,120 kw.	93,400	55,300
9	922	723	314	305	20	24	504	576	56	28	1,828	1,605	135	128	10	15	8,914	4,768
10	317	149	29	86	6	8	226	255	43	63	961	678	182	180	94	77	.....	.....
11	1,073	401	35	20	1	2	475	482	8	13	1,469	1,347	—No Record—		—No Record—		29,213	16,224
12	1,511	1,541	285	260	112	56	535	479	123	153	4,078	3,021	.....	.....	.....	.....	17,613	11,487
13	1,912	1,600	82	65	4	22	2,250	1,000	190	105	5,165	2,500	.....	.....	.....	.....	22,783	18,975
14	575	253	342	77	25	5	405	142	122	26	1,301	1,359	—No Record—				8,074	4,181
15	470	461	410	88	114	9	85	53	2	1	3,611	2,800	50	35	Not Available		15,238	11,975
16	—Don't Sell—		1,316	1,512	1,358	862	—Don't Sell—				572	1,096	8,890	8,065	61,718 hp.	72,745 hp.	65,527	76,988
17	2,536	1,444	327	134	154	6	199	12	42	4	4,876	2,294	8,058	1,640	.....	.....	11,287	9,235
18	994	961	82	5	13	0	853	652	71	21	—No Record—						5,400	5,400
19	356	455	13	11	.....	....	179	112	18	15	252	213	.....	.....	.....	.....	2,569	2,415
20	145	101	——	Do not sell	——		118	146	8	16	397	336	.....	.....	.....	.....	8,851	5,544
21	2,501	1,340	486	853	134	77	.....	....	.....	....	.....	.....	600 kw.	300kw.	8	4	17,700	16,900
22	105	71	2	1	.....	....	.....	7	8	7	.....	.....	426	452	80	68	4,223	3,607
23	227	164	186	138	26	19	.....	....	.....	....	.....	.....	.....	.....	.....	.....	2,400	1,500
24	1,065	557	562	113	276	3	520	657	11	21	.....	.....	419	.....	278	.....	39,752	42,292
25	729	427	160	50	14	3	466	468	60	58	2,176	1,551	.....	.....	.....	.....	.....	.....
26	139	206	435	379	143	143	—Don't Mdse.—						.....	.....	.....	.....	21,768	20,324
27	134	116	66	37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,750	2,600
28	1,894	1,733	466	297	187	219	852	661	83	101	7,721	9,721	1,983	2,219	.....	.....	38,817	35,785
29	137	269	166	102	23	34	200	123	38	29	1,924	1,798	.....	.....	8	8	5,222	5,521
30	607	219	142	11	46	2	136	57	13	13	823	650	.....	.....	.....	.....	.....	.....
31	1,579	1,067	91	101	.....	.....	.....	.....	.....	.....	.....	.....	133	119	.....	.....	5,432	5,010
32	777	794	81	89	70	7	272	173	48	25	1,845	1,602	32	38	.....	.....	4,000	3,500
33	170	94	335	51	279	67	24	15	2	2	600	494	.....	.....	2	1	8,634	6,274
34	521	128	314	77	156	44	374	194	88	53	.....	.....	173.4 kw.	.....	35	.....	8,806	5,754
35	1,747	774	1	1	1	0	1,535	568	112	30	3,160	1,705	185	.....	659 hp.	279 hp.	3,195	3,839
36	600	.....	10	....	10	....	.....	....	.....	....	.....	.....	.....	.....	25	.....	3,000	....
37	257	315	60	33	11	8	.....	....	5	17	—Don't Mdse.—		253	337	19	35	7,727	6,451
38	1,485	.....	380	.....	61	....	.....	....	.....	....	.....	.....	204	.....	.....	.....	12,650	1,200
39	740	163	5	5	4	4	21	32	5	7	3,350	1,842	.....	.....	.....	.....	20,000	20,000
40	264	339	202	95	60	7	244	317	32	18	.....	.....	200 kw.	.....	170 kw.	.....	4,343	3,289
41	488	416	18	25	26	20	676	....	216	....	4,931	2,741	700	.....	60	.....	($1,078 over 1933)	
42	1,750	250	1,800	300	25	15	125	150	30	40	.....	.....	.....	.....	.....	.....	.....	.....
43	—Not Selling—		59	46	11	8	.....	....	.....	....	.....	.....	.....	.....	.....	.....	827	726
44	657	332	1	3	0	0	49	76	1	1	—No data available—						(Same as 1933)	
45	Discontinued Sale		1,700	1,249	615	584	—Don't Mdse.—						556	479	.....	.....	.....	.....
46	2,019	1,361	83	47	4	1	622	258	114	73	3,721	2,452	—No Record—		8,206 hp.	5,491 hp.	40,000	40,000
47	None	.....	.....	.....	.....	.....	.....	....	.....	....	.....	.....	.....	.....	1,000 hp. (approx.)		6,000	6,000
48	553	.....	28	.....	None	....	121	....	2	....	576	.....	287	.....	51	.....	7,236	5,522
49	None	.....	.....	.....	.....	.....	.....	....	.....	....	.....	.....	5,121	.....	—None—		.....	.....
50	3,091	.....	539	.....	218	....	1,730	....	262	....	4,982	.....	249	.....	44	.....	28,233	23,125
51	344	136	225	86	273	50	388	243	193	127	2,553	981	.....	.....	47	.....	25,092	18,598
52	63	33	295	52	128	2	.....	....	.....	....	500	400	.....	.....	5	.....	4,052	1,649
53	215	90	74	42	42	13	139	26	11	7	1,062	468	318	12	100	79	9,200	9,597
54	357	541	43	50	3	2	162	138	31	10	1,762	1,829	19	.....	.....	.....	3,437	3,405
55	1,042	908	128	81	7	3	476	220	114	51	1,809	1,977	.....	.....	.....	.....	40,123	28,304
56	2,561	2,352	797	75	316	41	1,162	626	256	69	8,837	6,035	.....	.....	.....	.....	145,000	120,117
57	387	170	221	64	214	122	493	261	110	91	516	340	185	33	150	52	16,000	7,000
58	2,362	1,472	1,121	507	204	113	1,786	808	326	111	7,342	4,268	6,633	865	.....	.....	(38% over 1933)	
59	419	426	159	117	20	6	740	393	77	73	3,632	2,438	—Not Available—				.....	.....
60	1,485	1,247	409	369	115	105	966	946	270	81	9,460	6,709	303	106	5	.....	70,000	50,000
61	737	527	1,112	289	.....	....	527	432	160	61	13,683	8,530	.....	.....	.....	.....	100,000	95,000
62	—Do not sell—												1,891	2,056	505	452	81,843	91,900
63	418	292	659	517	227	224	599	244	85	38	1,421	1,142	330.6 kw.	.....	653.7 kw.	6	9,868	.....
64	809	686	568	337	39	78	252	107	32	18	1,810	.....	433	297	262	227	28,775	16,849
65	9,827	.....	1,722	.....	232	....	10,728	....	1,682	....	33,923	.....	.....	.....	.....	.....	60,000	10,000
66	251	387	554	206	379	55	1,010	997	54	55	.....	.....	.....	.....	.....	.....	47,000	33,000
67	3,133	1,970	34	2	1	....	1,683	733	124	64	1,656	1,082	194	.....	.....	.....	11,000	9,000
68	595	385	37	17	.....	....	176	146	22	16	730	606	8	7	3	2	4,070	2,770
69	1,489	1,182	105	48	4	5	16	24	7	13	956	1,214	222	166	154	169	4,633	.....
70	350	131	383	145	373	62	164	112	52	25	1,592	1,204	.....	.....	600 kw.	150 kw.	17,180	9,650
71	1,907	1,140	949	38	.....	2	1,345	1,066	43	11	8,705	6,680	403	529	9,445.64 kw.	7,886.18 kw.	39,682	36,304
72	839	676	102	66	47	52	283	188	83	24	19,976	13,912	80	92	243	209	70,000	26,000
73	2,968	1,608	1,374	370	467	225	72	46	14	12	8,401	1,831	.....	.....	.....	.....	44,000	38,000
74	5,000	2,799	644	532	303	222	2,090	2,086	277	367	34,905	24,710	1,499	1,222	2,146	1,245	44,238	22,171
Total	86,898	49,702	27,497	11,503	9,574	3,851	44,473	21,570	7,098	2,899	303,951	196,730	.....	.....	.....	.....	$889,492	$489,886

Our Operating Problems

What Must Be Done and Is Being Done in Operating Utility Systems Today -- Organization Required

MANAGEMENT of a utility today is a professional business, involving a sound business organization capable of meeting business risks, rather than a pioneering adventure in engineering and construction. Not that engineering talent is not just as important as formerly, but that the engineering emphasis is on different things and must be constantly tempered with business judgment. When the main problem was to get a system to carry load that was waiting well-nigh unsolicited to come on the lines it was natural that design and construction drew the more highly paid talent.

The operating problems have materially changed. In the old days interruptions to service were tolerated, even expected. Equipment and line failures were major operating problems. Not so today. Increasing competition and education in good service have both necessitated a type and continuity of service not known fifteen years ago. This is particularly true outside of the large cities. The development of the residential load from a mere lighting to an all-electrified home load has called for a quality of service to residential and rural sections equally as good as in the larger cities.

Complaint is sometimes made that the design and operating engineers spend too much money on plant and lines—that these could be built much cheaper. This is only a half truth. Frequently they could, but if customers are lost through interruptions to service, it is a "pennywise, pound foolish" method. Also, the increased maintenance on the cheaper construction usually more than offsets any capital saving.

A time of economy

Economy of operation is the watchword as never before. How is it to be obtained in the face of codes that shorten hours, raise wages and increase the cost of materials? How is it to be obtained in the face of a nation-wide labor unrest and a reduction in the output of practically all lines of manufacturing?

An experienced utility general manager suggests

Foci for Action

Reduce merchandise stocks

Inspect equipment closely

Saving in transportation

Change billing methods

Keep customer devices busy

Make sales to all homes

Certainly a sound organization, a well-balanced personnel, as between sales, operating and accounting, is a first essential. A loyal, contented body of employees — meaning that working conditions, hours of labor, and rates of pay are right—is another most important factor. With these and an intelligent understanding of present-day conditions much can still be done to reduce expenses and increase revenue.

One utility, in the past two years, by getting everybody interested, has reduced the stocks of merchandise necessary to transact its business 50 per cent and is now doing 100 per cent larger volume on this reduced stock. It meant fewer different models and larger turnover, with reduced stores and accounting expense. Similarly, in ordinary line extension materials, seemingly obsolete and dead stocks have been used up even if not exactly fitting the latest specifications, thus reducing inventories. Work of routine line extension crews was scrutinized and better planned, with much less left to the foremen's judgment. An engineer, going out in advance, checking up jobs as small as $100, and preparing a simple sketch and bill of material, frequently saved hours of idle time by a line crew waiting to get material that was found necessary after they got on the job.

Routine inspection, an old custom in large generating stations and substations, rigidly applied to smaller stations has saved many dollars as well as prevented unnecessary interruptions. Most companies keep a close watch on the loading on their large transformers. Not all watch as closely their distribution transformers. Yet, by simple load indicators and moving transformers where they were underloaded and substituting smaller ones, one company saved purchasing 13,000 kva. in distribution transformers over a two-year period.

Routine testing of poles and arranging to replace them on a planned basis, rather than haphazardly, reduced maintenance expense. Maintaining a high load factor on the company's electric repair shop by keeping the staff at a minimum and giving the peak jobs to the repair shops of the manufacturers is another way in which over a period of twelve months many dollars were saved.

Departmental co-ordination required

In a wildly scattered system covering 40,000 to 50,000 square miles the first cost and operating expense of automotive equipment are large items. In one company the assignment of one engineer to the specific task of studying all automotive requirements, regardless of what department they fell in, resulted in a reduction of unnecessary mileage operated of more than 10 per cent. It also proved that frequently, because of improvement in roads, lighter, faster trucks could be used to advantage. Planned sched-

ules for overhauling automobiles and trucks, analysis of exhaust gases, checking and adjusting carburetors, valves and spark plugs increased the average mileage per gallon of gas by more than 15 per cent. Reduced mileage and improved economy meant more than $100,000 a year saving.

Studies of meter testing, proper training of meter testers and posting of comparative records of different divisions of the company resulted in materially reduced costs.

Close co-operation between sales, credit and service departments during range and refrigeration campaigns resulted in prompt delivery and installation of merchandise, while at the same time the service department was able to route delivery trucks to have the least cost and mileage. Where companies are aggressively pushing a merchandising program, the service department, for installing and servicing ranges, water heaters and refrigerators, has become a major department, ranking in importance with the construction department, but with more opportunities for savings through intelligent management. It also has a wonderful opportunity for creating good will in its contact with customers.

With the increasing popularity of domestic appliances it is more important than ever, in order that the customer be satisfied, that judgment and experience of the engineers and operating men be made use of in determining the best type of appliances to sell.

Training schools for appliance service men proved very effective in increasing the skill of these men in handling cases of trouble. Careful analysis of the amount of free service given on appliances after the guarantee period showed that here was a place where considerable money could be saved by good salesmanship on the part of the service men. Teaching customers to replace fuses themselves has materially reduced the number and expense of domestic calls.

In connection with popularizing the new, reduced rates and systematic visits to every domestic customer by the young ladies of the home service department, who had nothing to sell, but whose entire interest it was to see that the customers' appliances were working properly, and their lighting adequate, brought out an avalanche of unused appliances which were readily repaired and put into service, much to the customers' satisfaction. It was found that these customers were all very appreciative of suggestions for improvement in home lighting and saving the children's eyesight, all of which meant added revenue, with little or no added investment by the utility.

System operation has become a fine art, but not a finished picture. Where several affiliated companies under a common parent company are interconnected at numerous points the matter of weather and load forecasting and the using of every available drop of water in the hydro plants to best advantage are matters calling for the best engineering talent. With run-of-river, storage-hydro plants, and with steam plants of various sizes, capacities and efficiencies, there are opportunities for the system operating engineer to save or lose hundreds of dollars every day.

Studies of the cheapest sources of power may frequently show that it will be cheaper to shut down the little old hydro plant rather than operate it, or than to spend any money modernizing it and making it fully automatic.

A large field that as yet has hardly been touched is the coordination of the utility company and those large industries in its territory with which, because of the nature of their operations, power is largely a by-product, and a by-product of which there is a surplus for many hours daily. Approached on a sound dollar and cents basis, usually a mutually advantageous arrangement can be made to utilize energy that would otherwise be wasted.

Studies of system losses and company use are worthy of the best engineering talent when these represent 16 to 23 per cent of the entire output of most systems.

The proper maintenance of distribution systems involves a multitude of details which are often overlooked and which in many cases directly result in

[*Continued on page 62*]

THESE IDEAS ARE GOOD *NOW*; PROFITS FROM TODAY'S WORK

UTILITY management problems in operation are few and not gigantic. As well expressed in this article, "We are running a big five-and-ten-cent store. There are many departments and profits will result only by attention to a multitude of details." The time is ripe for good housekeeping in utility operations. Each department needs to be scrutinized to see if it touches maximum efficiency in material, organization and operation. Now is the time to plan for the growth and expansion that is in the offing.

In this article a utility manager gives a splendid presentation of the present problems facing utility operators and cites case examples that come from his own experience. It is not expected that all utilities can apply the details cited, but the principles stated and the methods of approach are universal. Operation has become precise and professional and the deferred work of the depression must be handled at the same time that old organizations must be modernized and new and better methods introduced. This article gives a keynote for utility men in every department.

A Timely Symposium by Experts
in Their Respective Fields on

What Should Be Done

AGGRESSIVE SELLING *is now necessary; engineers should devote their attention to economy and operation; financing involves industry expansion. Suggestions for the solution of these problems*

Engineers' Problems

By A. H. KEHOE
Vice-President
New York Edison Company

ENGINEERING in the utility industry cannot properly be restricted to the design and construction of new facilities. Operations of that part of the property devoted to the production and delivery of electric service also have to be included. The many technical complications due to the necessity of regular maintenance or replacements of many elements of the system and at the same time of making necessary increases in capacity require, on any growing property, that engineering span design, construction and operations in order to obtain the full measure of system efficiency.

Organizations usually were set up to obtain proper co-ordination of these branches during the post-war period of rapid growth in the industry. With the recession in the use of electric service, engineering design and construction practically ceased so far as requirements for increased capacity were concerned. Many engineers made idle by such developments have become identified with the operating personnel and are carrying on the necessary, but greatly reduced, engineering functions in their new jobs.

In giving consideration to the engineering things to be done at the present time, as well as in the coming year or two, it is of prime importance for engineers themselves, as well as for executives, to recognize the underlying causes of these relatively recent trends in organization of engineering personnel. For the present state of the industry, wherein system capacity is ample to supply present load requirements, several summaries of the immediate engineering opportunities have been presented recently, particularly those reported at the usual June meetings. In general, the possibilities are of such a nature as to have organizations continue their evolution in the direction of scattering the engineering personnel. This application of technical talent seems proper as an expedient to be adopted during periods of little or no growth. As a permanent procedure, however, it forecasts a highly pessimistic outlook for the electrical development of the country. It is not proper to continue permanently with such form of organization for the most probable future to be expected. Today we have forces of unprecedented magnitude directed to popularizing the use of electricity, and it seems reasonable to anticipate, with the lifting of the depression, a restoration of the growth in loads at rates which will equal those experienced prior to the depression.

A. H. Kehoe

Under conditions of rapid growth in loads, full-manned engineering staffs again should be available to anticipate them, since much of the popularity for the service would vanish if present standards are lowered appreciably, even if for but a short time. System capacity must be available before corresponding load demands occur. With load growth restored, engineering personnel will again require proper co-ordination of design, construction and operations functions.

Unit costs of electric service are reduced so greatly by increased use of existing customers, due to improvement of load factor and also to the handling of larger volumes, that engineers are likely to ignore the possibilities of simplifying the design or improving the methods and the equipment so that only very low increment costs are necessary to supply large increases in use. Realization that reduction in costs obtained from any source is certain to further accelerate use should leave no doubt in engineers' minds that they will be under pressure to adopt every possible means of obtaining large capacity increments at minimum costs when developments get under way. Reduction in over-all cost to the public can also come from lowering utilization equipment and wiring cost, particularly for additions to existing installations. Utilities in general have applied very little engineering in this field. A few men only have been doing an effective job.

Growth is the gateway to re-established engineering. By and large, electrical growth at present is a matter of total cost for the service. While reductions in unit costs are inherent in the present utility system as increases in density of use occur, there are also further reductions which are highly probable for engineers to obtain by making low cost incremental additions to existing systems to supply new load. Means of lowering incremental costs and at the same time obtaining adequacy of service are the jobs which should be occupying engineers at present. The time remaining before these will be required may prove to be very short indeed.

Financial Suggestions

By E. K. WOODWORTH

Chairman Committee on Utility Securities
Mutual Savings Bank Association

MUTUAL SAVINGS BANKS are vitally interested in the present and future of the electric utility industry. They have invested several hundred million dollars in mortgage bonds of utility companies in the belief that they afforded a safe medium for conservative investment. Their confidence has been based upon faith in (1) the indispensable character of the service, (2) demonstrated efficiency of management, (3) long-established earning capacity, (4) freedom from wasteful competition and (5) safety from confiscation. Of these five factors only the two first remain intact. Increased taxes, higher costs under NRA and demands for lower rates, while, generally, not threatening interest on mortgage bonds, have impaired earnings and, in many cases, reduced equity values with deplorable effect on the market price of bonds. Invasion of the utility field on a huge scale by the federal government and threatened duplication of existing facilities without compensation for the resulting damage have shaken the very foundations of our faith. The net result is that mortgage bonds backed by equities so large that the market price is governed chiefly by current rates of interest are the only issues which still retain a high investment rating. Junior issues, which ever must represent the foundation of the capital structure, are depreciated; in many instances to a degree unwarranted.

As it is with existing securities, so it must be with raising capital necessary for future expansion. The nub of the matter is fair treatment at the hands of the public. To some degree, and varying with different localities, the wisdom and tact of utility managements will play an important part in influencing public action. Unless, however, confidence in fair treatment is maintained or restored it is improbable that junior issues, particularly common stock, will attract the funds of conservative investors. There is little to inspire confidence in common stock when New York passes a law authorizing a return of only 5 per cent upon an undetermined rate base. Without strong equities mortgage bonds will find a poor market among institutional investors. The problem of selling common stock is not ours, but it does, to our regret, threaten to limit the field for investment.

The bonds most attractive to savings banks will be of short or medium maturity, secured by a mortgage which provides for amortization of debt, at least to a degree insuring its gradual reduction.

A Call to Sales

By T. K. QUINN

Vice-President General Electric Company

THE industry cannot possibly carry the burden of its present expense, including such heavy charges as taxes, up the rocky road of low rates without much greater consumption of electricity and many more dollars of income. Maybe not then. The outlook is bad enough if we assume the maximum of sales activity and load building, but it is quite black without it. Bad enough, because of the unusual uncertainties and the known unfavorable facts to be faced. Black, if the worst is accepted.

There ought to be extended sales executive meetings in every utility company. Not the routine kind, either. They should begin with a review of recent developments and a question and answer discussion of what we dignify with the word "policies," but which are often no more than petrified preferences or prejudices. It is of the utmost importance for every company to discover just how amenable and flexible it is. This is not a bow to the unscrupulous agitator. It's a recognition of the temper of the times. There should be no "policies" which cannot be changed if the weight of reason and good sense favor a change. My own conviction is that every company should assume active leadership in local appliance and load-building sales and do it now. Wherever the decision is against direct

T. K. Quinn

company selling, let the indirect effort be much greater.

It is well enough to turn the load-building responsibility over to distributors and dealers, providing they understand and accept that responsibility and are held collectively accountable for predetermined results. Simply to stay out of merchandising, without organizing the dealers or checking and helping them, is not turning over the responsibility—it's just careless abdication.

Dealers should be led and pushed, guided and helped. It just isn't possible to do too much for them, for the good of the cause. The aid should be pointed and practical. A ten-dollar bill spent by a dealer to advertise the Jones refrigerator will do more good than a one-hundred-dollar paid advertisement of the great, intangible benefits of electricity. To state that so and so may be secured "from your local dealer" is a consumer let-down. Much of the stuff is so politic and broad that it is flat.

Where a company is selling it can set an example of aggressive activity, make room for all, but lead the parade. Whatever is done must be our utmost. The moaning department with the Amen choruses should be separated from the sales department. Who knows how good or bad it's going to be? But who doesn't know that it will be much worse if we do not carry on under full steam.

First of a Series of Intimate Talks with Industry Executives

Liversidge Points the Way

An interview by

EARL WHITEHORNE

✦ ✦ ✦

FOR the past four years Horace Liversidge has been carrying on a laboratory experiment for the power industry. The laboratory has been the city of Philadelphia and several surrounding counties. To most people it has just been an outstanding job of co-operative association work in a large city. But it means more than that. It has been an experience in building good will for the power industry. Out of this background he has arrived at a conviction as to the problem that confronts power men today.

"What should be done to meet the present rising tide of popular displeasure and political antagonism against the power industry?" This question was put the other day to Horace Liversidge in Philadelphia.

"Let's look at the cause," he said, "and then you see the cure. The present position of the power companies is the result of an integration of local irritation, suspicion and antagonism that has built up into a national sentiment. It is this which the politician is now reflecting. For his responsibility is to act for his constituents. What they think he is supposed to express. What they want he is expected to work for. So state by state this attack on the power companies has become an issue in the Legislature. National politicians have taken it up as a new plank to ride on. It has become a national issue.

"In short, the whole present opposing program is the result of national political leadership. Relief, therefore, can only come from a well-organized national movement by electrical men who believe that our vast power system should have a fair deal.

"Such a movement would not be defensive—just to protect the power companies—but creative, progressive, constructive. It would frankly direct itself to purging the power industry of poor leadership and bad policies wherever they may be and work to preserve it and expand it for the greater service of the American people. Its ultimate purpose would be to rebuild public confidence in our industry and public pride in the great record of electrical achievements that spring from the inspiration of Edison himself.

"In this," says Liversidge, "it seems to me that we would be just subscribing to the same social ideals that President Roosevelt and the Tennessee Valley Authority are preaching. Only we would be proving that the same devotion to public interest and the same zeal for progress in the universal enjoyment of electrical service can be best furthered under the highly skilled direction of the existing power systems, operating under private ownership. We can only prove this, however, by our actions. And we can expect popular sentiment and political policy to favor us, as the agents of the public in the great electrification program that now clearly lies ahead, only if we show that we are worthy of this trust."

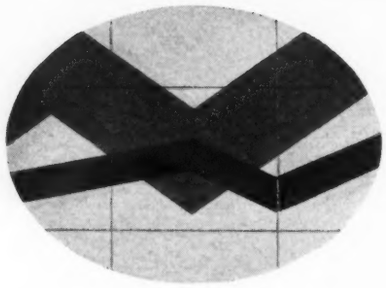
Liversidge is frankly facing the fact that the power industry has now lost that great fundamental resource necessary to any national business—the confidence of the public nationally. He believes, therefore, that the greatest weakness in the present situation is the fact that most utility men are still thinking and working locally. And nothing is being done nationally to rebuild this confidence.

"For the trouble," he says, "is not local. Talk to any operating executive and you will find that his company is doing a better job than at any time in the history of the company. Why, then, if power is a local service and this service has been consistently improving, is this great wave of unpopularity still growing? The answer is that the service rendered by the local company is not the measure of local opinion of the power industry. It has now become a matter of national sentiment and national policy."

Horace Liversidge believes, therefore, that the power companies can have no hope of any improvement in their present status with the politicians until the industry itself recognizes that this condition can only be cured by national policy and national action throughout the industry. Such unity of policy and action, he holds, can be accomplished through co-operation among the executives of the electric utilities who have the contact with the people. The first and vital step must be the awakening and organizing of a national consciousness throughout the electrical industry, supported by a will to meet the new conditions of social and political responsibility. When this takes place the public will notice and respond.

"This is no problem of determining what policies are good or bad," he says. "We know that now. It is a matter of facing the facts and readjusting to the times. And once this readjustment is general, the rest will follow. America will welcome and reward a frank and valiant co-operation on our part, just as it is now punishing what it regards as our past neglect of the public interest in a business involving national resources and a common necessity of modern life."

HORACE P. LIVERSIDGE, vice-president and general manager of the Philadelphia Electric Company, past-president of the Association of Edison Illuminating Companies, president of the Electrical Association of Philadelphia and for years a wheelhorse in the electrical industry



NEWS OF THE INDUSTRY

Power Survey Opened by Commission

National inquiry to cover all power needs — Municipal plants included — Private companies heartily co-operating

Schedules for the information desired for the National Power Survey undertaken by the Federal Power Commission at the direction of President Roosevelt have been developed, after long study and consultation with utility executives and public authorities, and are being sent out to power companies and municipal plants throughout the country, Vice-Chairman Basil Manly, in charge of the survey, announced this week.

"The schedules are comprehensive," Mr. Manly said, "but no unnecessary questions are asked. Each item covers some point that is essential to a complete and accurate showing of our generating systems, transmission lines, present capacity, development possibilities and future demands. Each one has been phrased so it can most easily be answered by the reporting agencies. . . . Determining the nation's power requirements, and how they can be most economically and advantageously supplied is the primary purpose. Markets must be considered, as well as power sites that can be developed at reasonable cost.

Steam and hydro balance

"Water-power development, while the major objective because of the federal government's direct interest, is not the only element. Proper utilization of steam and Diesel plants is also being given the most serious consideration. One purpose of the survey is to establish and maintain that balance between steam and hydro-electric power which will give America the most dependable sources of energy at the lowest possible rates.

"Realizing its value to the entire electrical industry, private companies are co-operating as heartily as governmental agencies. Prompt and full replies to the questions scheduled will enable us to compile and submit to Congress the most comprehensive and authentic exhibit of our power resources and possibilities ever made in this or any other country.

"Dependable capacity, drainage area of watershed, volume of water in storage by months and gross monthly kilowatt-hour output are asked for each hydro-electric plant as well as type of water-wheel runner, maximum horsepower, operating speed and head. Generator information includes continuous overload capacity, voltage, phase and frequency. . . . Total installed generating capacity, continuous carrying capacity as limited by condenser water, fuel consumption in tons, annual cost of fuel, and other operating expenses, and kilowatt-hours generated are comprised in the information requested regarding steam-electric plants.

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Utility Code Suggestion Ready for Presentation

At the fall meetings of the various geographical sections of the International Association of Electrical Inspectors the utility idea of what the National Electrical Code should be will be presented. About four years ago the light and power company group on the electrical committee of the National Fire Protection Association asked leave to set up a code form not changed as to requirements, but radically changed as to set-up and arrangement in order to clarify the requirements and bring out unmistakably the fundamental object to be attained by each rule.

The light and power group has now completed this suggested form and is ready to present it for constructive comment and criticism by other groups on the electrical committee. The suggested form will be printed and will be available for distribution at the regional I.A.E.I. meetings. It is intended that the suggested form, including such ideas as may be taken from discussions at the I.A.E.I. meetings and other places during the fall and winter, will be presented formally to the electrical committee at its biennial meeting next March.

P.W.A. Allotments Total $192,518,900

Tennessee Valley grant not included — Five projects will absorb $146,250,000 — Many small communities aided

Exclusive of the fund allocated to the Tennessee Valley Authority for power development on the Tennessee River, the Public Works Administration has made allotments totaling $192,518,900 which will result in the generation and distribution of cheap electricity by publicly owned power plants and distribution systems, Public Works Administrator Harold L. Ickes reported last week.

The federal government is spending $146,250,000 of this money for five giant projects—the Bonneville and Grand Coulee dams and power plants on the Columbia River in the Pacific northwest section of the country, the Fort Peck Dam on the Missouri River in Montana, Boulder Dam and power plant on the Colorado River and the Casper-Alcova project in Wyoming.

Non-federal P.W.A. allotments for construction of power plants and distribution systems by municipalities and other local public bodies total $46,268,900. These projects are estimated to cost $50,031,293, with the recipients of the allotments furnishing from other sources the difference between that figure and the amount allotted by P.W.A. These non-federal projects are estimated to create 141,000 man-months of direct employment on construction sites. A much greater amount of indirect and industrial employment will be created by them, for a large share of the money goes for manufacture of generating machinery, engines and other materials and equipment that will be built elsewhere for installation at construction sites.

A number of non-federal allotments were made for modernizing old plants in order that they may be enabled to give better service to the communities owning them.

The money being spent by the Tennessee Valley Authority for power de-

velopment on the Tennessee River is not included in the $146,250,000 reported by Administrator Ickes as being spent by the federal government as a result of P.W.A. allotments, for the T.V.A. money was not allotted by P.W.A.

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Baltimore Utility Plans $18,000,000 Offering

Plans for new financing for Consolidated Gas, Electric Light & Power Company of Baltimore, which have been under consideration for several months, are nearing completion with the compilation of final data this week for a registration statement calling for the issuance of $18,000,000 of bonds. Under the plan now under contemplation the new bonds will carry an interest rate of 3¾ per cent. This is the first public utility bond issue ever proposed carrying a coupon rate of less than 4 per cent. Proceeds of the new issue will be used for the retirement of $13,850,000 general mortgage 4½s, due Feb. 14, 1935, and for the redemption of two underlying bond issues aggregating $824,400. These are the Annapolis and Chesapeake Bay Power Company's first 5 per cent and 5½ per cent bonds, which are due in 1948.

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Middle West Utilities Plan Barred by Noteholders

Reorganization plans for the Middle West Utilities Company continued at an impasse this week with the noteholders' committee and the common-stock holders' committee at odds over what the gigantic utility system is worth and whether it actually is solvent.

The program proposing a single stock issue submitted by Orville J. Taylor, counsel for a common-stock holders' group, was rejected unconditionally by Robert N. Golding, attorney for the noteholders' committee. In a fourteen-page letter addressed to Mr. Golding, Mr. Taylor denied the need for new money and suggested a "fair and equitable distribution" among all investors.

Secured creditors, who were to be bought out for $11,340,000 under the noteholders' plan, would receive 40 per cent of the stock. Noteholders and unsecured creditors would obtain 30 per cent, preferred-stock holders would take 20 per cent and common-stock holders would receive 10 per cent.

"You can either deal with us sensibly on a basis of existing facts or you can continue to live in a dreamland created by Insull bookkeeping," Mr. Golding replied. "But you can't do both. . . ." Mr. Golding said that stockholder representatives refused to admit that Middle West was an insolvent company. The most important thing to consider in any reorganization, he said, was the value of the assets, and before common-stock holders could have a legal interest in the company the assets must be worth more than $142,000,000, the amount of secured claims, notes and preferred stock.

Federal Judge Wilkerson ordered the reorganization plan for the company to be presented for approval on September 20, an extension of three days over his prior order.

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New York Utility Probers Select Chief Engineer

Roy Husselman of Cleveland has been appointed chief utility engineer for the New York joint legislative committee investigating public utilities, John E. Mack, chief counsel to the committee, announced this week. Mr. Husselman will receive a salary of $9,600 a year. He has been a utility engineer for 30 years and has had experience in Eastern, Midwestern and Southern states. He has been retained by many municipalities and states in rate cases and for appraisals, including the Power Authority of New York State in 1932.

In making the announcement Mr. Mack said that so far his staff had experienced no trouble in obtaining information from public utility companies and that he did not intend to exercise the wide powers possessed by the committee until he had to do so.

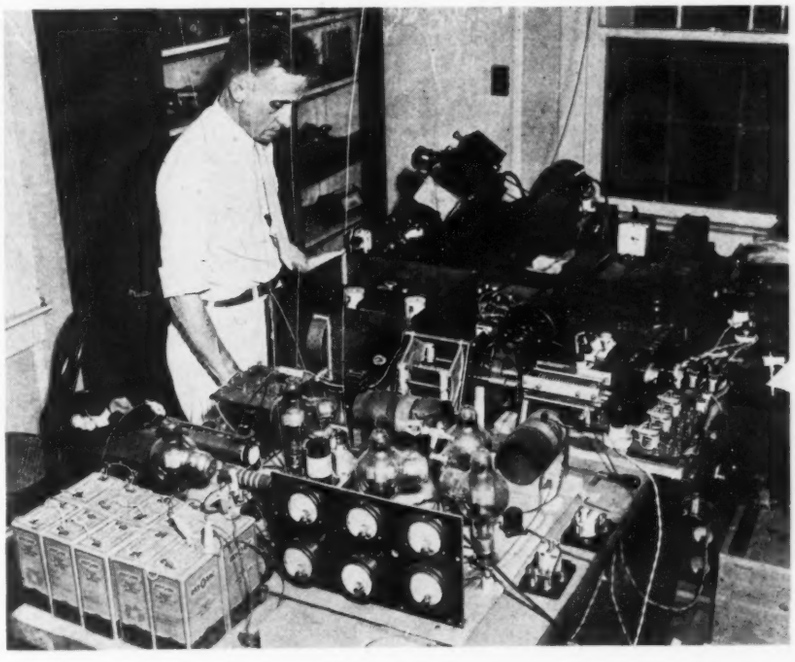
T.V.A. Power Recommended for Memphis in Report

Power supplied by the Tennessee Valley Authority has been recommended for Memphis by R. W. Husselman, consulting engineer, in a report submitted to Mayor Overton. The report estimates it will cost $7,867,000 to build a complete new distribution and street lighting system. This includes every item of cost. The system will pay for itself in full, together with all costs and expenses, pay taxes to the city and county and accumulate a surplus of $5,203,422 in twenty years, the report said.

"In my judgment," Mr. Husselman said in his report, "it is wholly feasible for the city of Memphis to build a new electrical distribution system and engage in the electric business on the basis outlined in this report, to its profit and certainly to the great financial benefit of all users of electricity."

The report shows the annual revenue that would be derived from the sale of 126,368,660 kw.-hr. a year in Memphis would produce a revenue of $2,161,512 at rates prescribed by the T.V.A. It is further shown that the Memphis Power & Light Company is now receiving more than $4,000,000 annually for power sold in Memphis. This would indicate a saving of more than $1,800,000 in power bills. The residential light rates, according to the report, would be cut 41.77 per cent and the total saving on power bills for all classes of consumers will be 45.56 per cent.

BUREAU OF STANDARDS AFTER RADIO ECHOES



Long-delayed radio echoes raise puzzling questions of electrical theory and disturb radio transmission. This apparatus records these echoes on photographic paper in a research of the Bureau of Standards at Beltsville, Md.

New Deal Power Policies Attacked

Federal program threatens destruction of great industry—Administration policies causing colossal losses through unwarranted duplication and government competition — Appeal to the American people's sense of fair play suggested by Commissioner Wells

ASSERTING that the power policies of the federal government are threatening the destruction of a great industry without adequate compensation to its investors for the loss of their savings, Hon. Henry G. Wells, chairman of the public utility law section of the American Bar Association, sounded a clarion call for a square deal to the power companies on Monday of this week at the Milwaukee convention of that body. For many years a member of the Massachusetts Department of Public Utilities, intimately familiar with industry policies, regulation and trends in government, Mr. Wells minced no words in attacking the Washington administration's treatment of utilities as inconsistent with its ostensible crusade to do away with unfair competition. More than half the population of the country is affected by the situation, the speaker declared. There is likely to be little left to measure with the much-vaunted "yardstick," Commissioner Wells said, after the various governmental agencies have finished with their victim. He demanded that the innate sense of fair play of the American people be called upon to put a stop to the government's destructive policies, asserting that "the industry itself has been so browbeaten and intimidated that it apparently dares not reply for fear of further political assault."

"Honest believers in government ownership," said Mr. Wells, "have always assumed that the government would take over the existing property rather than create new, and would compensate the existing owners of whatever property it so took over. But now governments are going into the electric business in competition with existing companies, disregarding largely the interests of the owners of the latter, not buying them out, but forcing them out without compensation, and the sole purpose alleged is to provide a 'yardstick.' What will be left after the various governmental agencies have finished is problematical."

"If the government must go into competition," said the speaker, "the least that could be expected would be fair competition. . . . The government creates unfair competition by its own acts. It attempts to force the industry into compliance with code provisions which it does not itself live up to. It strives to raise prices of materials and labor used in the industry, and when the industry co-operates to that end, while not looking for praise, it is met with accumulated and persistent abuse and a demand for lower prices of its own commodity. Additional and special taxes are levied on the industry and the government competitors are specifically exempt from such taxes. It is a new thought in government that tax revenue be used to impair the source of such revenue."

Operating companies victims

The attitude of the government and of a substantial portion of the public is undoubtedly in large part due to the spectacular collapse of certain holding and interrelated companies, said the speaker, but this fails to distinguish between such companies and operating companies. Nothing too severe can be said about some of the practices that have come to light in the past few years, but these do not justify such wholesale condemnation. Such evils as continue to exist can be weeded out without destroying the entire industry. "What is to be the result of the present agitation?" asked Mr. Wells. "The faults of holding companies are to be remedied by destroying the underlying operating companies. The losses to investors in holding company securities are to be compensated for by greater losses to investors in operating company securities. If government officials are interested in the security holder, the small investor, as some spokesmen have alleged, are they aware that taking the low base of January 1, 1933, such investors in utility securities have incurred losses that make the Insull losses, as someone has decribed it, look like penny ante losses!"

Millions of citizens imperiled

"Besides the individual investor," Mr. Wells averred, "every insurance policy holder, every bank depositor whether savings or commercial, all those interested in colleges, schools, churches, hospitals, welfare institutions and fraternal organizations that hold these securities are vitally interested. It may be said that reference to the destruction of an industry is altogether too strong language, but there are already strong indications of what is going to happen. . . . The business of the private companies is being raided.

COMING MEETINGS

Pennsylvania Electric Association—Annual convention, Bedford Springs, Pa., September 5-7. E. W. Judy, Duquesne Light Company, Pittsburgh.

Producers and Distributors of Electrical Energy—Fifth International Congress, Zurich and Lausanne, Switzerland, August 29-Sept. 7. Secretary, Union des Centrales Suisses d'Electricite, 301 Seefeldstrasse, Zurich.

American Institute of Electrical Engineers—Pacific Coast Convention, Salt Lake City, Utah, September 3-7. General Convention Committee, 1016 Continental Bank Bldg., Salt Lake City, Utah.

Rocky Mountain Electrical Association—Annual convention, Estes Park, Colo., September 10-12. G. E. Lewis, Managing Director, Gas & Electric Bldg., Denver, Colo.

Association of Iron and Steel Electrical Engineers—30th convention, held in conjunction with the Iron and Steel Exposition, Cleveland, Ohio, September 18-20. J. F. Kelly, Empire Bldg., Pittsburgh, Pa.

National Electrical Exposition — Madison Square Garden, New York, N. Y., September 19-29. Ralph Neumuller, Electrical Association of New York, Grand Central Palace, New York.

Electrochemical Society — Sixty-sixth convention, Hotel Pennsylvania, New York City, September 27-29. Colin G. Fink, Columbia University, New York.

Illuminating Engineering Society — Annual convention, Baltimore, Md., October 1-4. D. W. Atwater, Secretary, 29 West 39th St., New York.

American Welding Society—Fall meeting, Hotel New Yorker, New York, October 1-5. M. M. Kelly, Secretary, 29 West 39th St., New York.

National Electrical Manufacturers Association — Annual meeting, Chicago, October 17-20. W. J. Donald, 155 East 44th St., New York.

EVENTS IN WASHINGTON

Studies of sources of federal revenue are understood to have led to the conclusion that no additional tax on electricity should be recommended to Congress. Further levy on that source of revenue would antagonize the states. State taxes, existing and in early prospect, promise to take as much revenue from that source as can be undertaken without setting up adverse repercussions.

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Inquiry at NRA offices reveals that there still is confidence that a code finally will be evolved for the electric light and power industry, although the draft sent to the President has not yet been returned for revision. In other quarters there is a feeling that the argument is prevailing that a code is not necessary for non-competing, publicly regulated utilities.

PAUL WOOTON,
Washington Correspondent.

Abitibi Probe Ends Before Commission

Deal upheld and condemned at hearings in Toronto — Former government counsel claims no evidence shown for better arrangement — Meighen on stand

As the "Abitibi deal" investigation in Toronto reached the summing-up stage W. N. Tilley, K. C., counsel for the former government, maintained before the federal royal commission conducting the investigation that not a particle of evidence had been produced to show that former Premier George Henry and the former conservative govenment of Ontario could have made a better arrangement than they did make in the acquisition of the Abitibi Canyon power plant from the bankrupt Ontario Power Service Corporation.

Mr. Tilley stated that the whole series of transactions from the granting of a power lease to the Abitibi interests in 1926, down through the purchase of 100,000 hp. of electricity from the Hudson Bay Power Company, Abitibi subsidiary, and on through the bankruptcy of the company's successor, the Ontario Power Service Corporation, and the acquisition of its power plant by the Hydro Commission, was above criticism and beyond reproach. It had been conclusively shown, Mr. Tilley claimed, that had former Premier Henry wished to make more money on his $25,000 in Ontario Power Service Corporation bonds he might have adopted other plans. For Mr. Meighen, former Hydro commissioner, Mr. Tilley had words of defense, stating that his action in preventing his companies in trading in O.P.S. bonds while a government decision was pending indicated his disinterestedness. Most of Mr. Tilley's argument consisted in a presentation of letters, documents and reports from the Hydro and government files, many of which, he charged, had been ignored by the commission counsel.

Slaght attacks Meighen

At a previous hearing Arthur G. Slaght, K. C., commission counsel, had relentessly assailed the appointment of Mr. Meighen to the Hydro commission as "purely political" and stated that his conduct in connection with the Abitibi deal had been "filled with impropriety." Mr. Slaght reminded the commissioners that, unpleasant as the task might be, they had to make a report on the evidence submitted. If misconduct existed, it could not be punished by the commission, but by "appropriate proceedings," he said.

The closing sessions were characterized by an earnest argument by Right Hon. Arthur Meighen, who scornfully and scathingly condemned allegations made against him in connection with the Abitibi deal.

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Utility's Loan Practices Criticised at Hearing

Charges that the Peoples Light & Power Corporation lost large blocks of its subsidiaries' securities by using them as collateral for loans were made before the Federal Trade Commission last week by John H. Crabtree, commission investigator. Mr. Crabtree testified that the company, through the control of its subsidiaries, was able to get the securities and then repledge them. The company, operating in several states, including Minnesota and New England, is in receivership.

Mr. Crabtree traced its growth from the time the W. B. Foshay interests of Minneapolis exercised control until it passed to G. L. Ohrstrom, a New York investment banker, in 1927. It was in his control until the receivership in 1931. "Heavy losses were sustained in Peoples surplus on account of its inability to meet its financial obligations," he said.

"Millions of dollars of obligations to New York banks, secured with subsidiaries' collateral, fell due subsequent to 1929, when an unfavorable security market prevailed. Demand was made by the banks for payment of these obligations which Peoples was unable to meet and thereby lost millions of dollars of these pledged securities."

Discussing the period of Foshay control, Mr. Crabtree reported that when Mr. Foshay began the acquisition of securities "he did not have sufficient funds to pay for them, so that when a contract involving a substantial amount was entered into by him a small down payment was made and the contract was immediately assigned to Peoples."

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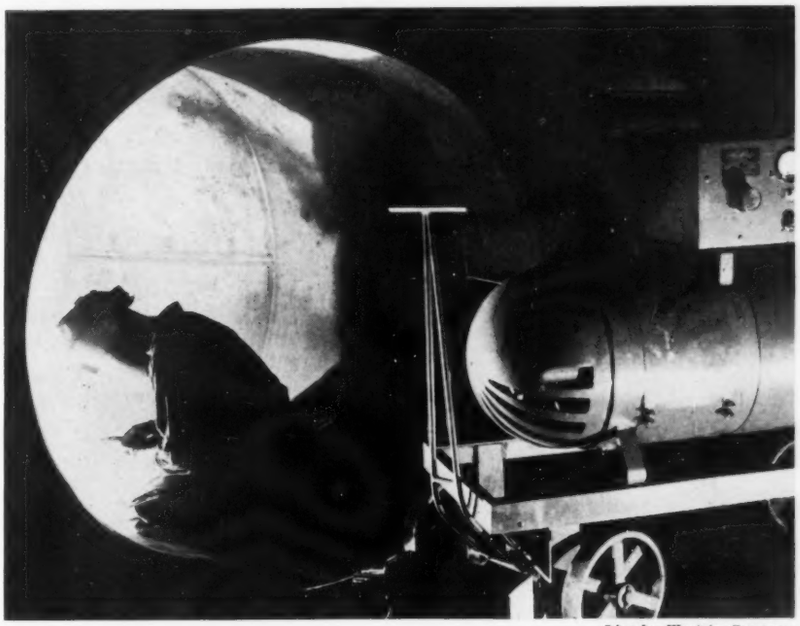
Secretary Ickes Surveys Maine Power Project

Having reconsidered his rejection of the loan application for the tidal power project at Eastport, Me., Secretary of the Interior Harold L. Ickes made a personal survey of the site last week. Accompanied by Major Philip M. Fleming, P.W.A. engineer; Gov. Louis J. Brann of Maine and members of the civilian commission appointed by Governor Brann to study the proposed development, Secretary Ickes' inspection covered the entire area from both land and water.

The tour of inspection took him through the reaches of Passamaquoddy Bay, where he had ample opportunity to study the flowing tides which Dexter P. Cooper, internationally known engineer, has aspired for years to see har-

ARC WELDING STAINLESS STEEL PIPE



Lincoln Electric Company

This unusual pipe, fabricated of two-ply stainless clad steel sheets, ¼-in. thick, will carry compressed air to aeration tanks at the Milwaukee, Wis., sewage disposal plant. The pipe, 1,800 ft. long, is 5 ft. in diameter for about two-thirds of its length, then is stepped down to 4, 3, 2½ and 2 ft. diameters as the air volume decreases to the end. The Cream City Boiler Company, Milwaukee, is the fabricator of the pipe and will do the field welding. This is the first use of stainless clad steel in this type of work.

nessed through a system of vast dams. P.W.A. had turned down an application by Mr. Cooper's company for a $49,000,000 construction loan. The board of review, while concurring in the engineering feasibility of the project, ruled that sufficient evidence of a market for the power it would produce had not been presented.

Convinced that if the economic soundness of the proposed development could be established Washington would lend a more sympathetic ear, Governor Brann recently appointed a commission headed by Dr. Kenneth C. M. Sills, president of Bowdoin College, to make a study of the project. Shortly afterward Secretary Ickes announced he would reconsider the rejection of the loan application and made plans to make a personal study of the project.

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100,000 Washers in July

Sales of electric washers in July exceeded those of the same month a year ago by 28 per cent. As reported by the American Washing Machine Manufacturers' Association they numbered 100,246, compared with 78,535 in the earlier period.

Sales of table model ironers rose to 6,536, against 3,983 a year ago.

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Electrical Merger Planned for United Kingdom

Private discussions are now in progress in London for the reorganization of the electricity system of the entire United Kingdom. The parties engaged in the negotiations are the state electricity departments, the British Electricity Commission and the Central Electricity Board, together with some of the larger municipal and private electricity enterprises.

The proposals put forward are stated to range from the creation of a great controlling public corporation, formed on the same lines as the London Passenger Transport Board which operates all metropolitan passenger transport services, to a system of local mergers. It is expected that before the end of the year there will either be a measure of agreement among the undertakings or the government will be forced to impose its own terms. No matter what plan is adopted, it is certain that a number of prominent undertakings will be wiped out or absorbed in the course of the merger.

The anomaly of the present situation is that, whereas the problem of bulk supply has practically been solved by the completion of the national grid network, the problem of distribution remains as far from solution as ever. There are 663 undertakings in the United Kingdom supplying current. Thus the extraordinary situation has arisen that, while the supply of energy is, or could easily be made, sufficient for the needs of every person in the country, great masses of the population cannot obtain it because of the chaotic state of the distribution industry.

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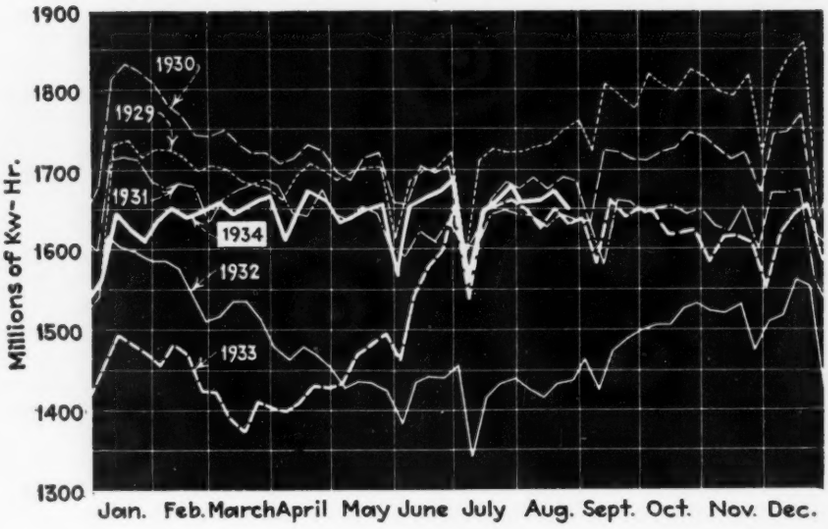
Los Angeles May Acquire Utility's Properties

Twenty-four proposed amendments to the Los Angeles, Calif., city charter, embracing numerous changes in municipal administration and including the initial steps toward the acquisition by the municipal Department of Water and Power of the electric properties of the Los Angeles Gas & Electric Corporation have been approved by City Council for submission to the voters at a special election to be held September 27.

Of the series of twenty-four amendments three relate to the Los Angeles utility. One proposes that the Department of Water and Power be authorized to borrow from the state or federal government the money necessary to finance the acquisition of the electric properties of the utility. The second seeks to authorize the department to take over a part of the outstanding bonded indebtedness of the company and the third to authorize the department to retain all employees of the corporation in their respective capacities without regard to civil service requirements.

Another proposed amendment permits the sale of excess power from Boulder Dam to private power companies in the first four years after completion of the giant project when such an excess is expected to prevail.

Output Trend Remains Flat



Still oscillating around the level of the past several months, the output of central electric light and power stations during the week ended August 25 decreased 1.6 per cent from the preceding week but surpassed that of the same period a year ago by 1.1 per cent. It amounted to 1,648,107,000 kw.-hr., according to the Edison Electric Institute. A gain over 1933 persists, but the margin has been small since the beginning of July, and the normal seasonal rise has not yet made its appearance. Compared with 1930 the latest figure shows a moderate recession, amounting to 2.5 per cent and due in part to the slight upturn in that year.

Favorable changes occurred in New England, where the disparity compared with 1933 is the smallest since the middle of June, in the South and on the Pacific Coast, both of the two latter regions reporting larger percentages of increase. In other parts of the country the gains diminished somewhat or changed to slight losses.

Weekly Output, Millions of Kw.-Hr.

1934	1933	1932
Aug. 25...1,648	Aug. 26...1,630	Aug 27...1,436
Aug. 18...1,674	Aug 19...1,650	Aug. 20. .1,432
Aug. 11..1,659	Aug. 12 ..1,627	Aug. 13 ..1,415
Aug. 4...1,658	Aug. 5...1,650	Aug. 6...1,427
July 28...1,684	July 29...1,662	July 30. .1.440

Per Cent Change from Previous Year

	Week ended		
Region	Aug. 25	Aug. 18	Aug. 11
New England.....	— 4.8	— 7.0	— 5.9
Middle Atlantic....	+ 0.7	+ 3.8	+ 1.7
Central Industrial..	— 0.6	+ 1.1	— 0.3
West Central.....	+10.5	+12.3	+11.5
Southern States....	+ 4.0	+ 1.9	+ 1.3
Rocky Mountain...	— 7.6	— 8.2	— 3.7
Pacific Coast.....	+ 6.0	+ 5.4	+ 8.1
United States.....	+ 1.1	+ 1.5	+ 1.9

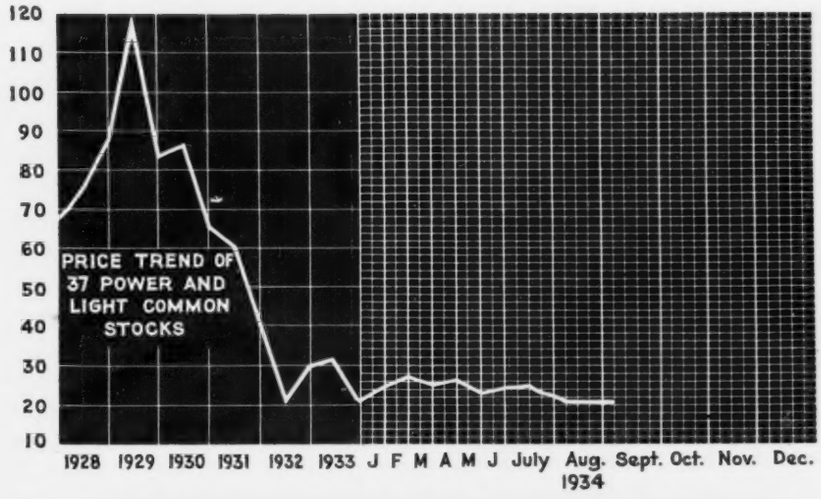
Uniform System of Accounts Ordered for Public Plants

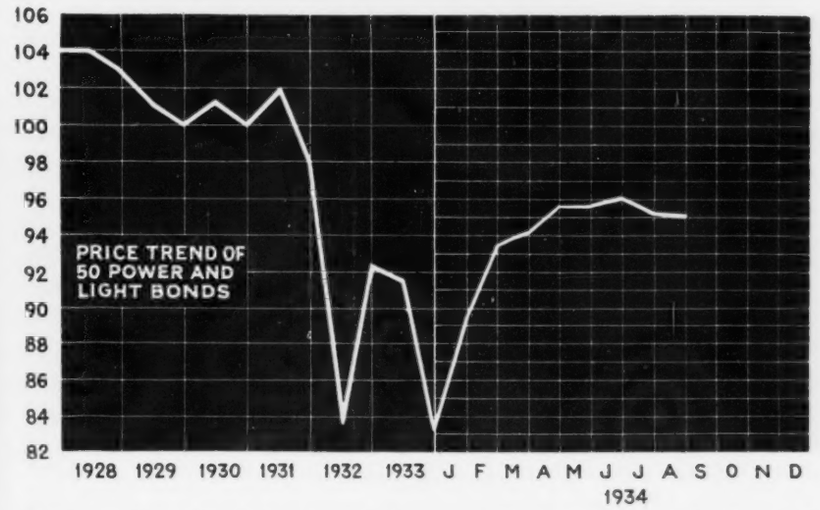
Public hearing on a proposed uniform system of accounts for municipalities engaged in the manufacture, sale and distribution of electricity for light, heat or power has been ordered by the New York Public Service Commission for October 3 in Albany. Copies of the proposed system are being sent to municipalities that would be affected in order that the provisions of the proposed accounting system may be discussed at the hearing. The commission has recently prescribed uniform systems of accounts for practically every other class of utility, including electric, gas, steam, telephone, water-works and omnibus corporations.

The commission has also entered upon a proceeding for the purpose of inquiring and determining whether methods, practices and regulations of municipalities furnishing electric, gas or steam service with respect to penalties imposed, if payment of bills be deferred, or discounts allowed, if prompt payment be made, are just and reasonable. A hearing in this matter will also be held on October 3. Copies of rules which are proposed to be made effective have been sent to the municipalities engaged in the utility business. These proposed rules prohibit penalties for deferred payment of bills and limit the amount of the discount which may be offered to 10 per cent on the first $10 plus not over 3 per cent on the portion over $10.

Such rules became effective March 1, 1933, for private utility corporations and since that time the municipalities have been urged to comply with them when filing revised rates. The rates of about 30 or more municipal plants, however, still impose a penalty or offer discounts which exceed the limits of the commission's order.

Bond Market Dull; Stocks Advance





Price trends of listed bonds remain uncertain. A mixture of gains and losses in the utility list brought the *Electrical World* index for August down to 95.1, compared with 95.6 in July. Utility stocks advanced slightly during the week: *Electrical World* index, 21.3; last week 20.9.

Group Formed to Promote Unit Air Conditioners

With the purpose of fostering and promoting unit air conditioners a new association, to be known as the Unit Air Conditioner Manufacturers Association, has just been formed, with headquarters in New York.

Preliminary figures indicate that the annual gross sales for last year of unit type of equipment was approximately $4,000,000 and that the current year will see this volume exceeded by 50 per cent or more. Unit type equipment covers not only the self-contained units, but many types of installations using a combination of units, operated from one central source. It is the aim of the association to guide the development of the industry along the proper lines so that the advantages to be gained by the buying public will enhance the continued development and use of air conditioning.

Officers elected at the last meeting were: President, P. A. McKittrick, treasurer and general manager Parks-Cramer Company; vice-president, Allston Sargent, president Campbell Metal Window Company; treasurer, Harry C. Grubbs, sales manager De La Vergne Engine Company, and temporary secretary, John A. Dewhurst.

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A. S. A. Names Industrialists for Advisory Committee

Nine of the nation's industrial leaders have been named to membership on the advisory committee of the American Standards Association, Howard Coonley, president, announced last week. George B. Cortelyou, president Consolidated Gas Company, will be chairman. Other members include; Sewell L. Avery, chairman of the board, Montgomery Ward & Company; Lammot duPont, president E. I. DuPont de Nemours & Company and chairman of General Motors Corporation; Walter S. Gifford, president American Telephone & Telegraph Company; Henry I. Harriman, president U. S. Chamber of Commerce; W. A. Irvin, president U. S. Steel Corporation; James H. McGraw, chairman of the board, McGraw-Hill Publishing Company; Gerard Swope, president General Electric Company; Daniel Willard, president Baltimore & Ohio Railroad.

New York Metal Prices

	Aug. 21, 1934 Cents per Pound	Aug. 28, 1934 Cents per Pound
Copper, electrolytic	9.00*	9.00
Lead, Am. S. & R. Price	3.75	3.75
Antimony	8.62	8.625
Nickel ingot	35.00	35.00
Zinc, spot	4.62	4.60
Tin, Straits	52.00	51.75
Aluminum, 99 per cent	23.30	23.30

*Blue Eagle.

ELECTRICAL WORLD

L. W. W. MORROW · EDITOR

PUBLISHED EVERY OTHER SATURDAY BY McGRAW-HILL PUBLISHING COMPANY, INC.

VOLUME 104 ESTABLISHED 1874 NUMBER 9

SEPTEMBER 1, 1934

Service Entrance a Bottle-Neck in More Ways Than One

SERVICE to the home can be viewed as an integrated function that merits fully as much attention as the generation, transmission, substation and distribution functions. At some time or another each of these has been a "bottle-neck" due to its lagging development or unco-ordinated expansion. Today the rising disposition to increase household usage makes the service entrance the "bottle-neck." On that account that portion of the system deserves attention on a functional plane.

The service entrance is no mere physical assembly of wires and devices. Every component of the path from transformer to outlet merits notice in its contribution to the main function. Size of service leads; sequence of meter-switch fuses; standardization of ratings; elimination of costs, annoyance and impediments to quick-service restoration; simplification of meter installation and testing, billing, records; thwarting of the diversion epidemic—these are all components of the problem of rendering superior service cheaply, continuously and smoothly.

When the Heavens Are as Brass

WHILE the country as a whole is being made "dam-conscious," nature is presenting an object lesson as to what may happen if, in the utilization of water power, the occasionally unreliable character of that source of energy is overlooked. Unfortunately, the object lesson will probably not be impressed on the general public, because nothing catastrophic has happened. The reason for this happy outcome is the foresightedness of engineers and executives in providing adequate steam reserves. Catastrophes are dramatic; the avoidance of them is unspectacular, yet the avoidance may be a far greater achievement than the rushing of emergency measures after the event.

When food supply is menaced and when the livelihood of thousands of people is cut off, as the result of a great drought, the whole nation is made keenly aware of the consequences. But when the same drought causes a diminution of hydro-electric energy of such magnitude that record-breaking loads are thrown on the steam plants, no one hears of it except a few persons closely connected with the power industry.

As early as June, the deficiency of water power had become so pronounced that the total output from fuel broke all previous records for the month. While the excess in the country as a whole was not significantly large, it rose above 17 per cent in one great geographical area. Meanwhile stream flow was still decreasing. Moreover, present knowledge of weather forecasting seems to afford no information as to rainfall conditions to be expected next year.

Several questions arise: With ground moisture seriously depleted, what margin will remain to carry the increased loads that normally pile up as daylight hours shorten? With federal water-power projects under way, designs to provide millions of kilowatt-hours annually, how much additional money must be invested in steam plants if and when this energy is to be supplied with the same standard of reliability that now prevails?

We Are Going Somewhere

WE COMMEND the attitude of Thomas N. McCarter. It is that of a leader. As shown in his statements in this issue, he is not afraid of the future: he has faith in the fairness of the public; he looks toward expansion for prosperity and, while cognizant of present problems and difficulties, he is confident and aggressive. He is wise to discount much of the new deal hysteria and clings to fundamental facts without getting lost in vain speculations about governmental expediency, political activities. This is an intelligent and constructive attitude.

No one can see far into the future through the murk that obscures the nation's future, but any one can see the work that lies at hand, and it is by accomplishing these immediate tasks that national affairs will be improved. For the electrical industry the road to prosperity lies straight ahead and it must be surveyed and constructed by the industry through its own efforts. There are obstacles to be overcome, but these are minor as contrasted with the rewards of accomplishment. Government competition reduced to facts and viewed in all its economic and social aspects is doomed. The problems of finance, taxes, codes and regulation can be solved. Public sentiment can be improved. All these handicaps can be overcome and will be overcome.

For private enterprise and initiative will survive, the profit motive will be retained, the electrical industry will go forward. Present earnings of the industry are better and are trending upward. All markets

are unsaturated and can be sold. Electrical equipment and electric service are fundamental. Facts warrant optimism and the psychology of optimism is necessary to progress. Recovery hinges upon going to work with the attitude exemplified by Mr. McCarter. This attitude is developing rapidly in the electrical industry. It is beginning to hum; it is going somewhere.

20,000,000 Refrigerators

TWENTY-TWO years ago 16 per cent of the people in the United States were living in electrically lighted homes. The light and power industry was 30 years old. During that period of less than a generation more than 3,000,000 domestic customers had come on the lines. Pioneers marveled at the growth. But the growth had only begun. During the middle twenties as many domestic customers were being added every two years as the total number of such customers revealed by the Census of 1912. By the end of the decade 70 per cent of our homes were being served and their number exceeded 20,000,000.

This is an old story, but it has a present application. Under the C.W.A. a survey has just been conducted of 64 representative cities. A preliminary report indicates that 16.8 per cent of the dwelling units are provided with mechanical refrigeration. This convenience, therefore, stands in popular acceptance about where electric service stood in 1912. It has emerged from the luxury stage. The cost of installing it probably compares favorably with the cost of wiring a home in the earlier days. The monthly operating cost is in similar relation to the expense then assumed by the householder in adopting electric light.

The prospect of installing 20,000,000 refrigerators within a moderate term of years is no more visionary than was the prospect of similar growth in the general use of electric service, of the automobile and the telephone. The chief difference is that it has been coming into reality faster.

More Valuable Than Ever

WHY is it that so few central-station power sales engineers have been taken off the payrolls of the utilities during the last four years? The power sales specialist has been busier than even the optimist could have predicted back in 1930. The reason lies in the fundamental point that he has shown himself to be an industrial service engineer rather than a mere vendor of electric power.

It goes without saying that the major duties of such men are to engage in profitable load building and in the protection of existing business. If this were all, however, the record would be far less notable. Thanks to the trained viewpoint and co-operative spirit of the industrial service engineer, the factory customers of utilities who buy power the country over have received such open-minded consideration of their changing needs that today the power companies probably have little real idea of the depth of confidence reposed in them by industrialists.

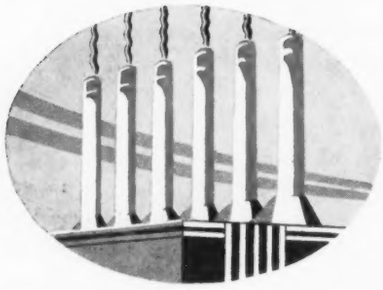
It is paying the utilities to show their customers how to avoid preventable wastes, rearrange and select equipment in plant modernization, improve control and wiring facilities, insure better lighting and more economical use of electric heating, and to buy central-station service on the most desirable rate basis for the conditions. Industrial service engineers on utility staffs have shown themselves to be competent and highly respected ambassadors to industry.

Better Housing—Better Wiring

ADEQUATE wiring is a necessary element of home modernization. And now there is an opportunity to sell adequate wiring as a part of the government's home loan program. Wiring is a built-in improvement that fits the government specifications for home loans. It is necessary to carry out the home electrical idea so strongly advocated by the administration. All branches of the electrical industry should seize this opportunity to sell adequate wiring, but the utilities in particular should take the lead in every community—it is good business and good public relations.

Adequate wiring has been difficult to sell to home owners. And no united industry effort has been made to sell it for many well-known reasons, although the electrical contractors have preached the gospel and at least have tried to get the sales. But now conditions are very favorable. The new heavy-duty electric appliances are popular and are selling. The market is active only in the homes already constructed. The government is pushing both home modernization and the idea of home electrification. All branches of the industry look to the domestic market for sales. Why not bring all these favorable conditions to bear both to get adequate wiring into existing homes and to establish wiring adequacy standards for homes to be built in the future?

Tie selling of appliances to the selling of wiring so that the home owner is attracted to the sales offer. Organize sales agencies in each community to tie together home loans, wiring sales and appliance sales. Get the banks and business enterprises to support the plan. Surely the utilities, retailers and contractors can get together in each town to take advantage of the present favorable conditions. Surely a national bureau or committee can and should be organized to develop this enterprise on a national basis and to aid local agencies. Here is an all-industry problem and here are conditions that favor the correct solution of this problem once and for all. This is a typical industry co-operative opportunity that points to prosperity. Why not seize it?



OPERATING THE SYSTEM

ENGINEERING • CONSTRUCTION • OPERATION • MAINTENANCE

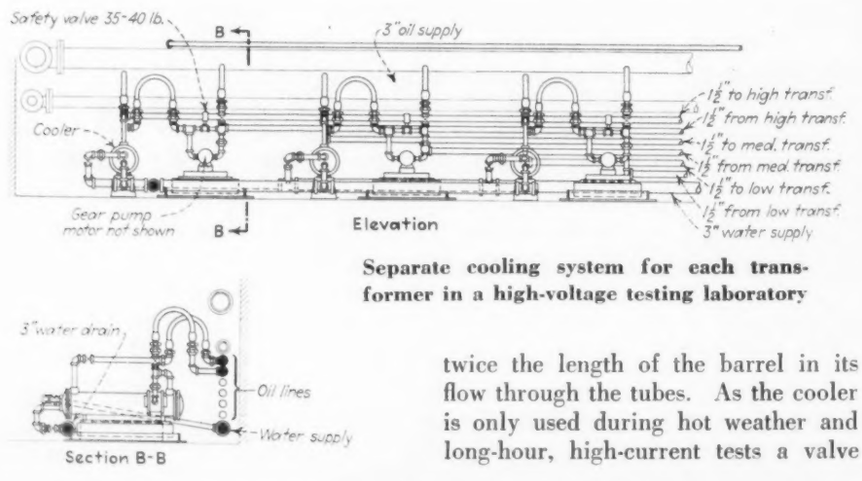
Oil Cooling Increases Transformer Loading

By RICHARD BANZ
Chicago, Ill.

Increasing the capacity of transformers by adding special cooling means to them is a device commonly used. Usually this is done by placing water coils within the transformer itself if there is room for them or by using an air blast on the cooling fins or pipes on the outside in which the oil circulates. A means which is being used by the Commonwealth Edison Company to raise the capacity of the three 350,000-volt transformers in its high-tension testing laboratory might conceivably be adopted for power transformers where other methods are difficult or impossible of application. This method is direct cooling of the oil in an external cooler.

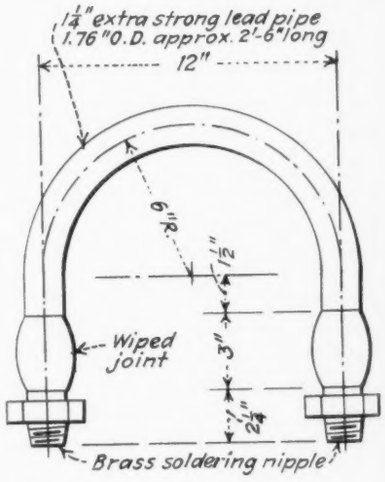
The test transformers are of sufficient capacity for short-time testing only; that is, up to one to five minutes at a time. The Commonwealth Edison Company has three such transformers installed at its laboratory at Northwestern station. An experiment, to use the same transformers for long, continuous tests, such as life tests for high-voltage, paper-insulated, lead-covered cables, resulted in overheating of the transformer oil. It was thus necessary to provide additional cooling, in other words, increase the capacity of the transformers. Forced air cooling through means of a temporary fan installation did not prove satisfactory, due to the fact that the high voltage of the transformer did not allow a close range installation of the fan. Oil cooling by means of water coils in the transformer tank could not be considered for the same reason.

A remote cooling system was finally adopted and installed, by which the transformer oil is brought from an outlet on the top of the transformer to an oil cooler (Schutte & Koerting type). From the cooler the oil is pumped through an inlet at the bottom of the transformer tank. The Schutte-Koerting oil cooler has a minimum water flow capacity of 15 gal. per minute. It is of two-pass design, in which the cooling water travels twice the length of the barrel in its flow through the tubes. As the cooler is only used during hot weather and long-hour, high-current tests a valve was installed on the water pipe leading to the cooler to regulate or stop the water flow according to needs.



Separate cooling system for each transformer in a high-voltage testing laboratory

Lead Loop Stops Noise and Vibration

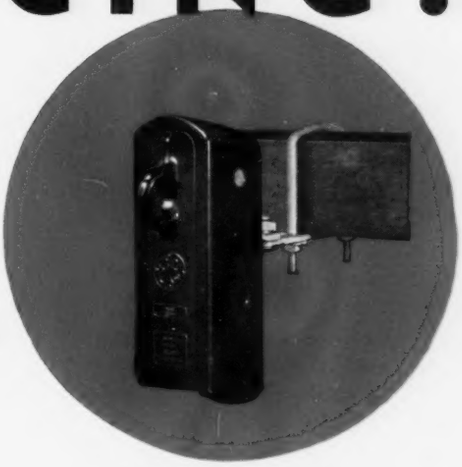


Lead pipe insert damps out pump vibrations

In installations where cooling water for power transformers is circulated by small pumps transmission of noise and vibration through the piping can be stopped by an idea borrowed from the high-tension laboratory of the Commonwealth Edison Company, Chicago. Here the oil for the 1,000,000 transformers is externally cooled. To prevent pump vibrations from reaching the transformers, lead loops, as shown in the illustration, were placed in the incoming and outgoing pipes at each pump. The lead does not transmit the noise and the loops are of large enough radius to arrest periodic movements of larger amplitude that produce rattling.

ANNOUNCING!

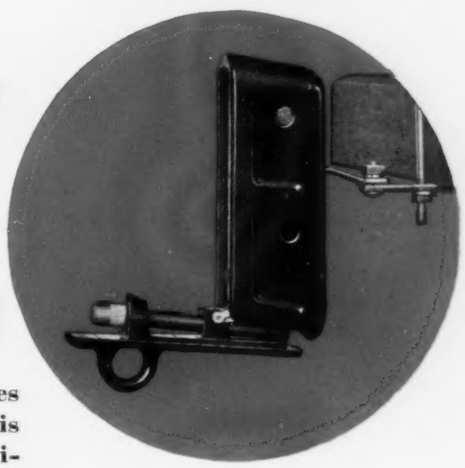
A NEW 2-IN-1 ENCLOSED CUTOUT..



THAT INDICATES LIKE THIS..
(VISIBLE FROM GROUND)

OR DROPS OUT COMPLETELY LIKE THIS . . . . . .

WHICHEVER YOU PREFER



This cutout has many other improved features. It saves time in detecting blown fuses and restoring service. It is now available in a 60 ampere, 5000-volt rating, and additional ratings are to be announced later.

This new cutout is meant to supplement, rather than to supersede, the popular and accepted line of G-E enclosed cutouts. Ask your G-E representative for further information, or send for Bulletin GEA-1993, which gives complete descriptive and operating data. General Electric, Dept. 6A-201, Schenectady, N. Y.

340-9

GENERAL ELECTRIC

We Saved $7,000 on Cable Crossing

By A. L. BRYANT
General Superintendent of Construction
Dayton Power & Light Company

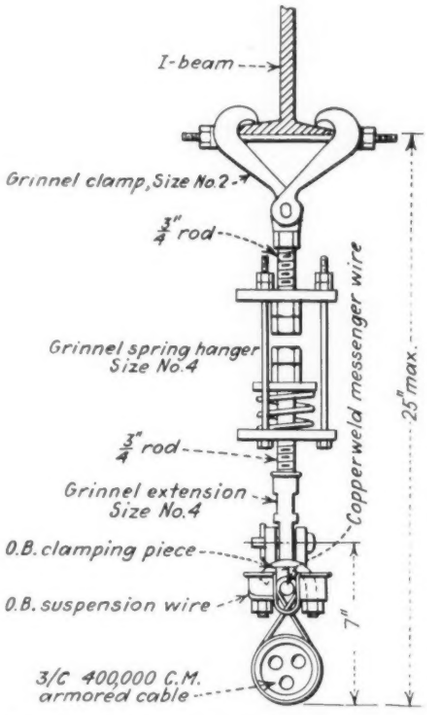
A saving of $7,000 under the cost of submarine cable or duct construction was effected in making the cable crossing over the Miami River between the Miller's Ford generating station and the West-side substation by employing the construction shown. To date the two 400,000-circ.mil, 12-kv., three-conductor cables involved have been operating for one year under weather conditions ranging from —16 deg. F. to 96 deg. in summer without failure or undue stresses on the cable supports.

One condition which influenced the construction was the fact that the Great Miami River, although not a navigable stream, is controlled by the Miami Conservancy District and its requirements as to dredging depths have to be followed in making submarine crossings whether they involve submarine cable or duct construction. After considerable engineering it was decided to suspend the two cables underneath the Broadway Street Bridge from §-in. Copperweld messenger strand attached to the bridge I-beams about every 10 ft. by Grinnel spring-suspension cable hangers. These were employed because the bridge is subject to considerable vehicular traffic producing vibration, which must be minimized in the suspended cable, particularly at supports to prevent chafing.

Armored cable used

Each cable (Habirshaw Cable & Wire Company) is composed of sector-shaped copper conductors insulated with 11/64-in. impregnated paper wrapped with 3-mil soft perforated copper tape. Around the three conductors, so protected, is a 5-mil copper binder tape incased with an 8/64-in. lead sheath. Outside the sheath is one layer of duct tape and twin armoring composed of two layers of 2-in. wide by 0.03 in. thick galvanized-steel tape. The armoring in turn is protected by a covering consisting of duct tape, asphalt compound and soapstone, making a completed cable 2.675 in. in diameter and weighing 11.66 lb. per foot.

Two 1,000-ft. lengths of cable were required between manholes at the bridge approaches, although the bridge itself consists of three 225-ft. spans. Between the manholes and the portion of the crossing where suspended cable was used standard fiber conduit construction was employed, the ducts being aligned with the messenger strands. Expansion loops were provided in the cable between adjacent bridge spans.



Spring hanger for messenger-supported bridge cable crossing

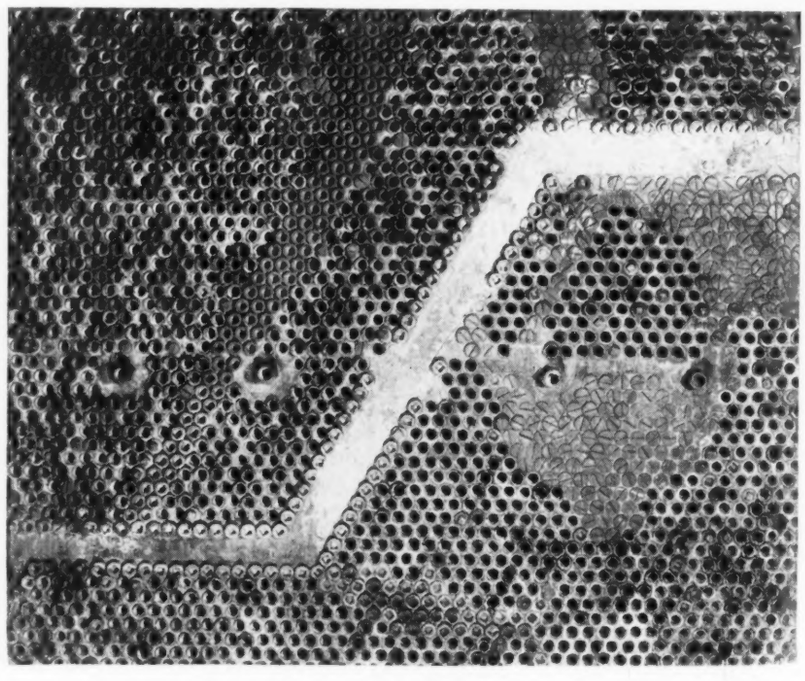
Metal Spray Gun Saves Condenser

Maintenance methods often develop new and interesting ways of deferring new investment in plant facilities. A Pacific Coast steam plant made use of the metal spray gun to rehabilitate a condenser which was beyond ordinary methods of repair.

The condenser was between sixteen and eighteen years old and had been redesigned to include special steam lanes. During its many years of operation the bronze face between the two halves of the condenser had become badly corroded and was in such a condition that the salt condensing water was leaking into the steam chambers. The condition was so pronounced that unless it was remedied the condenser would have to be junked and replaced with a new unit.

This replacement was desirable only as a last resort and consideration was given to several possibilities for repairing or rebuilding the condenser.

It was decided to try to rebuild the corroded metal in the tube sheet of the condenser with a metal spray gun, which consists of a mechanism that feeds a metal wire through an oxyacetylene flame, practically volatilizing the metal, which is then blown in minute molten particles on the surface to be covered. In this case the tube sheet was bronze and consequently a bronze



Tube sheet in an old condenser repaired by the use of a metal spray gun

Use Increases When Pilfering Is Stopped

Group	Aver. Kw.-Hr. Before Installing Theft-Proof Meters	Aver. Kw.-Hr. After Installing Theft-Proof Meters	Increase in Kw.-Hr.	No. of Customers in Group	Kw.-Hr. Increase per Customer Max.	Min.	Aver.
1	380	1,107	727	19	247	3	38.3
2	1,483	2,481	998	51	91	—20	19.5
3	962	2,663	1,701	36	201	—13	47.3
4	1,027	1,578	551	23	125	0	24
							30.6

wire was used in the gun. The sheet was so badly corroded that it was necessary to deposit in some places as much as $\frac{3}{4}$ in. of metal to build the sheet up to its former thickness. The spray gun permitted building up the entire area to a relatively smooth flat surface which needed but little finishing to make a satisfactory facing for the partition between the halves of the condenser. Examination of the metal deposit revealed that it was of homogeneous structure and integral with the original metal. The cost of the repair outside of the labor involved in opening the condenser was only that of the materials used in the metal spray, the labor of the operator and the hand finishing necessary to smooth up the face.

Thus a satisfactory repair job was completed at a relatively low cost and the capacity of the unit made available for future use. Metal spray technique, while new to this country, has been pioneered in Europe and offers an economical way of salvaging many worn or corroded machine parts.

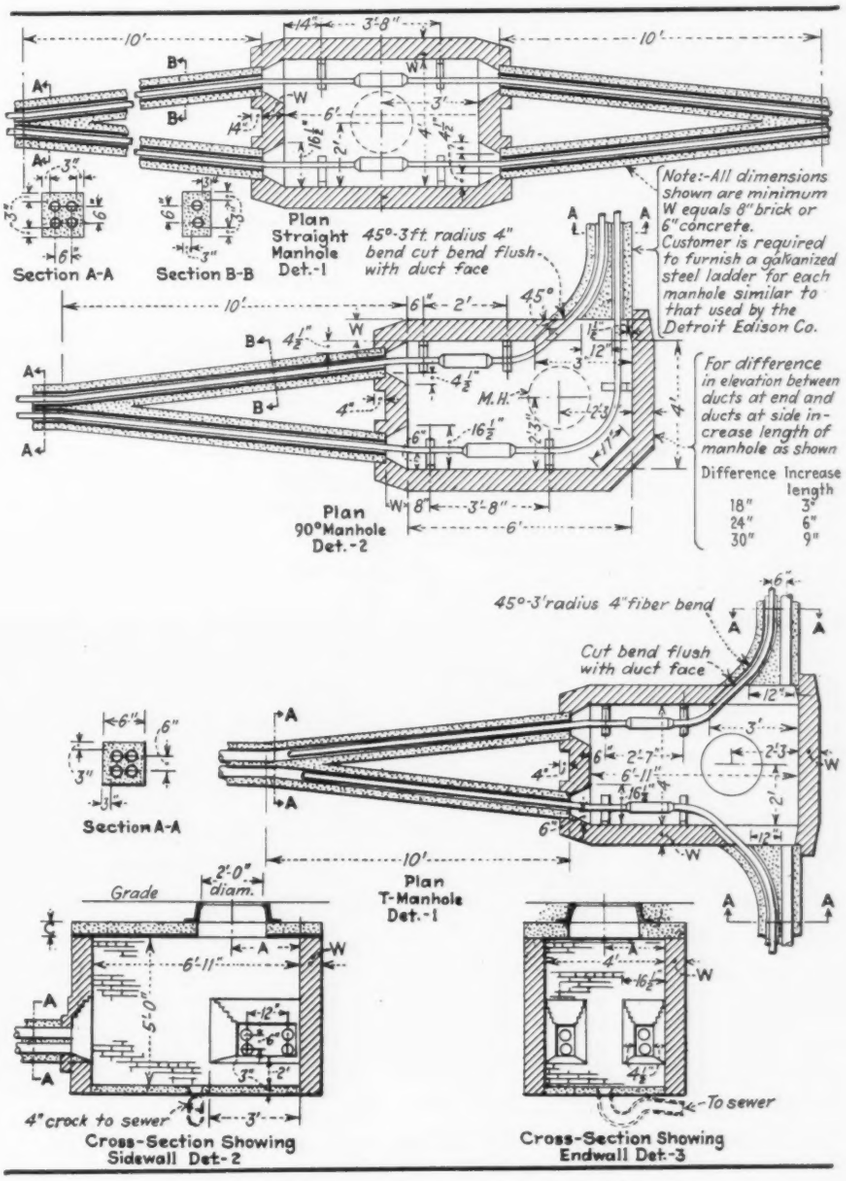
Billings Rise After Checking Diversion

Executives have asked whether prevention of energy diversion shows results which justify the expenditure. At a Portland meeting of the engineering and operating section of the Northwest Electric Light and Power Association, L. D. Snow (Puget Sound Power & Light Company, Seattle) showed that some 30 kw.-hr. per month increase followed removal of the jumpers or other tricks. The data in the accompanying table are from four groups of accounts from different localities.

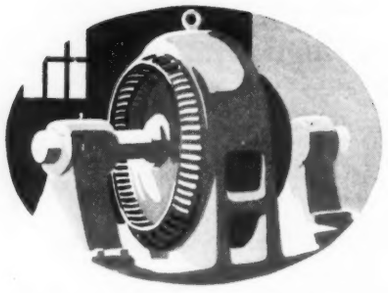
The last group represents an increase of about 75 cents per month. Twelve customers in group 3 disclosed (against pole meters) a diversion of 361 kw.-hr. per month per customer. The same accounts showed a gain of only 55.7 kw.-hr. per month per customer from which revenue could be recovered except from back billing. Assuming an average of 75 cents per month per suspected customer could be reclaimed by installing some method to stop diversion along with 15 per cent return on investment, an expense of $50 to $60 per suspected customer would not be excessive in an effort to stamp out the evil.

Primary Customers' Manhole Design

The design of manholes for primary customers can be different from the standard for main runs because there is generally a smaller number of cables to be installed. The accompanying illustrations show three types of primary customer manholes used by the Detroit Edison Company. Maximum separation is provided at the duct face to lessen hazard of cable failures burning adjacent cables.


Plan Straight Manhole Det.-1
45°-3 ft. radius 4" bend cut bend flush with duct face
Section A-A
Section B-B
Note:-All dimensions shown are minimum W equals 8" brick or 6" concrete. Customer is required to furnish a galvanized steel ladder for each manhole similar to that used by the Detroit Edison Co.
Plan 90° Manhole Det.-2
For difference in elevation between ducts at end and ducts at side increase length of manhole as shown
Difference Increase length
18" 3"
24" 6"
30" 9"
45°-3' radius 4" fiber bend
Cut bend flush with duct face
Section A-A
Plan T-Manhole Det.-1
Grade
2'-0" diam.
4" crock to sewer
To sewer
Cross-Section Showing Sidewall Det.-2
Cross-Section Showing Endwall Det.-3

Detroit Edison uses three types of manholes

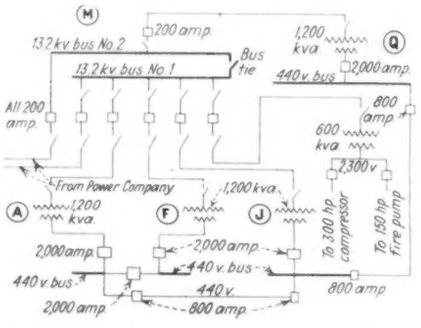


PUTTING THE POWER TO WORK

LIGHTING • MOTORS • CONTROL • HEAT • AIR CONDITIONING

For Service Continuity

To guard against interruption of service at the East Springfield, Mass., factory of the Westinghouse Electric & Manufacturing Company, duplicate 13.2-kv. feeders from the United Electric Light Company's nearest substation are provided, together with an internal 440-volt tie cable installation of unusual flexibility. In the plant there are now about 3,500 motors aggregating 10,500 hp. in rating. The factory purchases all its electrical energy and consumes about 1,000,000 kw.-hr. per month. At least two and frequently three sources of 440-volt energy are available at the various buildings used in manufacturing processes and the scheme of supply is illustrated in the above drawing.



Reliable and economical service gained by bus and low-tension tie circuits in large industrial plant operated on central-station energy

The two power company feeders are each about ½ mile long, of three-conductor No. 4/0 cable laid in underground ducts. Each is capable of supplying the full load of the plant. Energy is received and metered at a main factory substation, M. Normally the two 13.2-kv. buses are run in parallel. Four high-tension feeders are taken off to 1,200-kva. three-phase transformer banks at local factory substations A, F, J and Q, a fifth feeder supplying a 600-kva. transformer bank serving an air compressor and fire pump. Each of these last is driven by a 2,300-volt motor, and a steam fire pump is in reserve.

The internal factory power service is at 440 volts, and by tying the secondary sides of the various substations together, as shown, continuous supply is available under various conditions. This arrangement allows any substation to furnish power to the entire plant at periods of light load, and on such occasions the primaries of the transformer banks F and Q are deenergized to save transformer losses. All these power transformers are connected delta-delta to permit open-delta operation in the event of any transformer failing.

Luminous Structures —a New Idea

Using light as an architectural material, Luminous Structures, Inc., of Los Angeles, developed a new technique in the use of illumination to arrest public attention. As will be seen from the accompanying illustration of a service station, lighting panels have been used as an architectural element of the building.

The effect is obtained by placing banks of incandescent lamps behind translucent glass and using decorative metal for a finish. It is the conception of Edward G. Neale, president of the new concern, that the front of stores, shops and buildings can be constructed entirely of illuminated glass panels fabricated together to form an interesting and attractive pattern, combining beauty with the sales value of light. The distinctive character and

Contoured by light, this filling station in Long Beach, Calif., illustrates the new technique of building luminous structures.

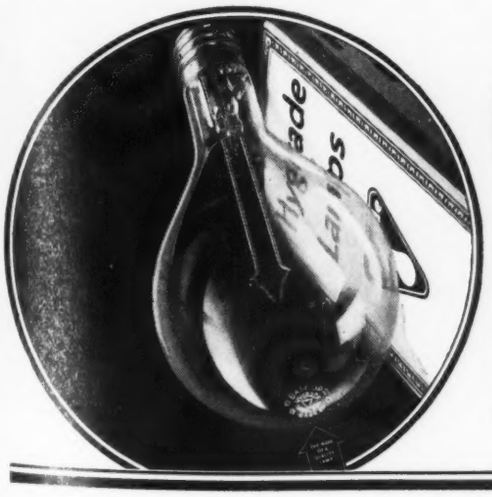
18 kw. of lighting is represented in this architectural treatment, the intensity of which is best indicated by the fact that the picture is a night snapshot.

FOR EVERY VITAL SOCKET . . . HYGRADE OFFERS GOOD LIGHT

STREET SERIES LAMPS	CUT-OUT LAMPS
INSIDE WHITE BOWL LAMPS	VACUUM CLEANER LAMPS
ROUND BULB LAMPS	ARC-RESISTING LAMPS
STANDARD INSIDE FROSTED LAMPS	COUNTRY HOME LIGHTING LAMPS
MILL TYPE LAMPS	TRAIN LIGHTING LAMPS
ROUGH SERVICE LAMPS	DAYLIGHT LAMPS
FLOODLIGHT LAMPS	TRAFFIC SIGNAL LAMPS
VIBRATUNED MILL TYPE LAMPS	LOCOMOTIVE HEADLIGHT LAMPS
SPOTLIGHT LAMPS	COLORED LAMPS
LARGE WATTAGE LAMPS	SEWING MACHINE LAMPS
DECORATIVE LAMPS	STREET RAILWAY LAMPS
SIGN LAMPS	

● For more than 30 years, this company has served the cause of Good Lighting by manufacturing and promoting only full-standard, high quality lamps.

The accompanying list shows the extensive range of types that carry the Hygrade name today.



HYGRADE LAMP BULBS

A PRODUCT OF
HYGRADE SYLVANIA CORPORATION
Salem, Mass.
MANUFACTURERS OF HYGRADE LAMPS,
SYLVANIA RADIO TUBES, ELECTRONIC DEVICES

MAKERS OF FINE INCANDESCENT LAMPS FOR MORE THAN 30 YEARS

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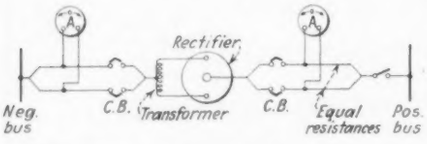
comparative brilliance of such installations make these structures dominate their surroundings. From the utility standpoint, the character and amount of load in such structures offers attractive revenue possibilities, and from the civic standpoint the night-time appearance of streets upon which such structures are installed is greatly improved.

Current Control by Breaker Contacts

By J. C. WOODS
Engineering Department, Commonwealth Edison Company, Chicago

In installations of 3,000-kw., 600-volt mercury-arc rectifiers for traction supply on the system of the Commonwealth Edison Company it was necessary to split the direct-current copper into two parallel runs. The current divides between these runs inversely in proportion to the resistances of the respective circuit breaker contacts. Measurement of this current division was adopted as a means of supervising the breaker contact conditions. This was accomplished simply and economically by the method shown in the accompanying illustration.

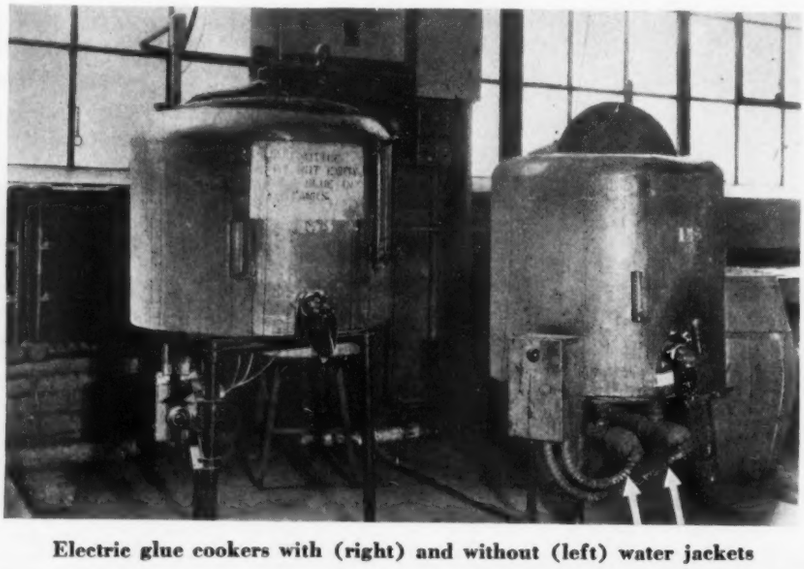


Current division supervises breaker contacts

A zero-center-scale millivoltmeter calibrated in amperes is connected across the two parallel runs at points electrically equidistant from a point of junction of the two runs. This meter will indicate the unbalance between the two runs directly and indicate by the direction of deflection which run is carrying the greater load. Readjustment of the breaker contacts may then be made to attain normal current division, which will be indicated by the zero position of the meter connected across the paths.

Modern Glue Heating

Absolute control of temperature possible with electric heat has brought electric glue cookers into wide use in paper box factories, binderies, furniture and wood-working plants where the need for keeping glue at just the right heat at all times is an important one. Electric heat can be used to greatest advantage on a cooker without a water jacket because of the low temperature gradient and the fact that the initial heating of a large quantity of water is eliminated, and with it the possibility of the water evaporating and causing trouble. Both types, each using a total of 3 kw. in heating elements and each continuing to perform with complete satisfaction after five years of constant use in a paper box plant, are shown in the accompanying illustration. The cooker on the left is equipped with flat type electric heaters clamped to the bottom. The glue pot to the right, formerly steam-heated, has two immersion units under its water-jacketed exterior.



Electric glue cookers with (right) and without (left) water jackets

Electric Heat for Steam-Jacketed Pots

A central steam source to supply heat for steam-jacketed pots in which inflammable materials are melted has always been considered a necessary part of the equipment of paint and varnish plants. Expensive because steam-jacketed melting pots of average size require only three or four applications of heat a day of one-half to one hour each in length, a very real economy was achieved in one concern specializing in making industrial finishes when the superintendent built an electric melting pot, consisting of a sheet-metal cylindrical shell 40 in. high and 33 in. in diameter, inside of which was built up a lining of insulating brick. The heating unit consisted of standard stock strip heaters mounted between two steel hoops, which were then fastened inside the container, and the melting pot lowered inside of the heater assembly.

Standard stock strip heaters are held between two steel hoops

Revolving paddles operate inside the wax pot, thoroughly mixing the contents—resins, waxes, gums or varieties of oils and thinning materials. The revamped pot, with a capacity of 30 gal., will turn out 1,000 lb. of melted products of high quality per day.

Accurate heat control, necessary when some materials are to be added at definitely predetermined heats, is obtained by means of a dual control system, consisting of a first range which carries up to 120 deg. F. and a second which goes on to 450 deg. F. The whole installation totals 10.5 kw. in strip heating units.

Preparing for the Upswing . .

Nothing is more basic to the operation of industry than power, and when a typical cross-section of industry begins to modernize and extend its boiler plant facilities in a substantial way it is a sure sign that hope of better business has become definite expectation.

That a strong trend toward modernization and extension of steam generating facilities is under way is indicated by the very substantial volume of business we have obtained during recent weeks. Some of these contracts are listed on the opposite page to show the character of the work and its variety with respect to equipment, size of installation, industry, etc.

These contracts also serve to typify the range of C-E equipment and experience, the character of the Company's engineering and manufacturing facilities, and the confidence reposed in it by men responsible for the economic and operating success of installations ranging from small boilers and stokers to complete steam generating units of record proportions, involving design problems that require the most competent engineering available.

It is on the basis of such qualifications that Combustion Engineering seeks the opportunity of serving you. Whether your requirements involve stokers or boilers for capacities of less than 100 hp. or steam generating units larger than any thus far built (C-E units hold the world's record for steam production per hr.), our purpose is identical —to give you the most suitable type of equipment for your conditions and a completed job that will operate dependably and economically throughout its lifetime.

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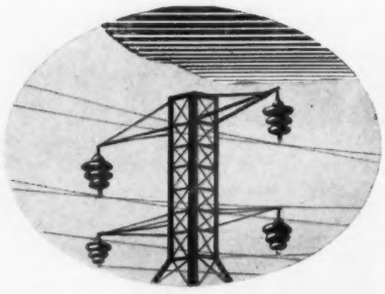
ENGINEERING



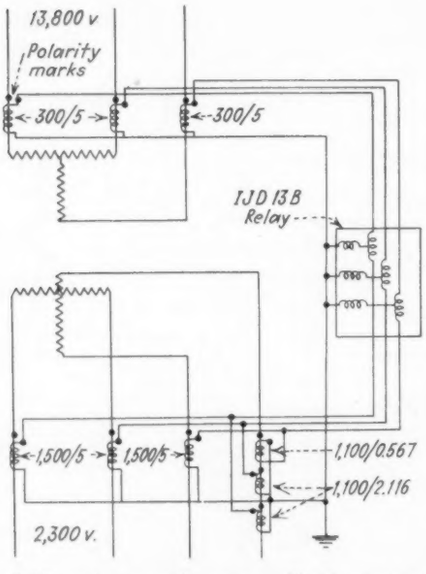
NEW ENGINEERING PRACTICE

THEORY • DESIGN • MANUFACTURE • CONSTRUCTION • UTILIZATION

Protection for Scott Transformers

By E. H. BANCKER
Central Station Engineering Department,
General Electric Company,
Schenectady, N. Y.

An interesting problem recently encountered was the application of differential protection to a transformer having an unusual connection. One winding is *T*-connected to supply 13,800-volt, three-phase power. The other is also *T*-connected with an extension of the pillar of the *T*. Two-phase, 2,300-volt generators are connected to this winding and three-phase, 2,300-volt power taken from three of the leads. The bank thus serves as a two-phase to three-phase transformer and auto-transformer.



Odd ratio transformers afford protection for two- to three-phase bank

The solution involves the insertion in the *T* extension of two current transformers having a ratio $\sqrt{3}$ times those in the other leads and a third whose ratio is 6.47 times the others. The combination of the secondary currents of the additional current transformers with the usual set in the three-phase leads produces a three-phase set of currents which is equal in size and angle with the output of the current transformers in the high-voltage leads for any condition of balanced or unbalanced load or fault currents. Protection may then be provided by means of an ordinary percentage differential relay.

A Non-Inductive Cable End-Bell

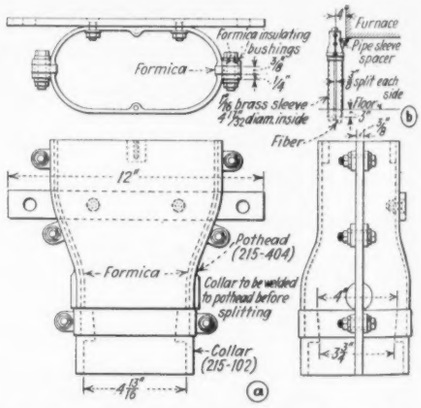
By GEORGE E. WHITTAKER
Resident Electrical Engineer
Chase Brass & Copper Company,
Cleveland, Ohio

Such is the arrangement of the heating elements in the electric furnace used for bright annealing tubes at the Cleveland plant of the Chase Brass & Copper Company that through the use of a double-pole, double-throw switch the units can be connected either in three-phase (star) for high heat or single-phase for low heat.

When the drawings were being made it was found that the end terminals of two of the coils to be connected together to get the single-phase layout would be on opposite sides of the furnace, and to bring them together it would be necessary to go either over the top of the furnace or beneath it.

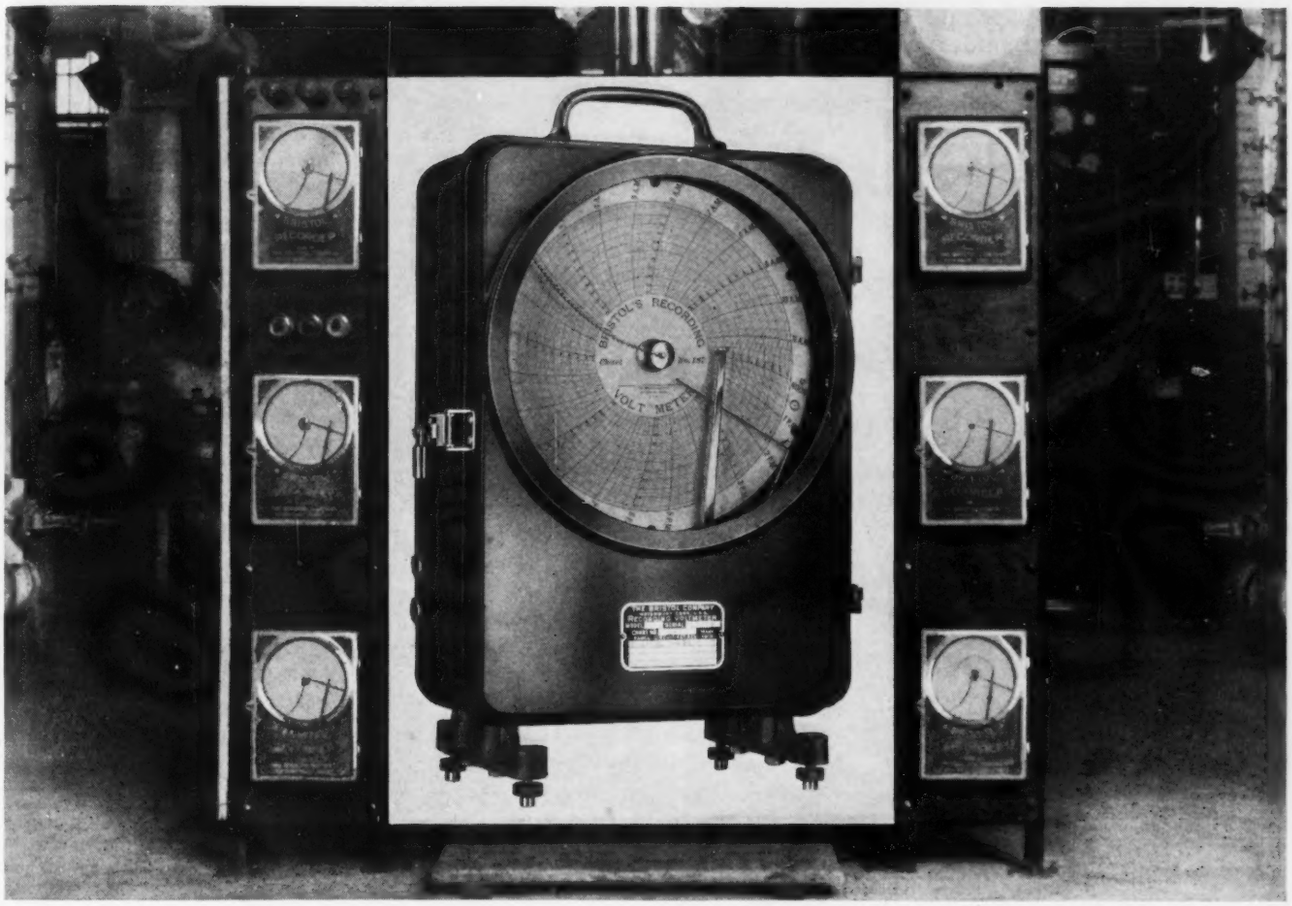
It was found virtually impossible to carry the leads over the top of the furnace due to several obstructions. To carry them underground it was necessary to substitute a non-inductive fiber conduit for iron conduit. Because it was desirous to use some old paper-insulated cable already on hand, it was further necessary to furnish a cable end-bell in carrying the leads underground.

A non-inductive cable end-bell was made up by taking the pattern used in the regular end-bell, splitting it down the center and casting a new end-bell and all its appurtenances in two pieces (instead of one). With these two pieces provided with ears for insulated bolts the whole assembly could be bolted together with a piece of black fiber (machined to fit the outline, both inside and out, of the pothead) between the two halves. As the cable end-bell was 2 ft. above the ground level a brass sheath was devised to protect the fiber conduit. This sheath was made by taking a brass tube of the same inside diameter as the out-



Cable end-bell made non-inductive by splitting and inserted insulation

(a) Standard pothead split after welding on collar. For mica (⅛-inch) for insert and for bolt bushings.
(b) Attached to base of furnace by angle iron. Split brass sleeve averts eddy currents and protects fiber duct.



Six Bristol's Recorders, three on each end of the board in power house of well-known manufacturer. Center insert shows Bristol's Improved Portable Voltmeter, Model 512.

Service Veterans
yet still going strong

SIMPLICITY, strength and practicability identify the Bristol's Recorder. Here you will find no complicated parts or devices likely to get out of order, nor any inherent weakness to cause failure in the service for which the instrument is recommended. ¶ Like so many thousands of other Bristol's Recorders serving industry, the six shown above are veterans of long standing. Yet they are as dependably accurate today as they were the day they were installed. ¶ Write for bulletins describing latest models for your work.

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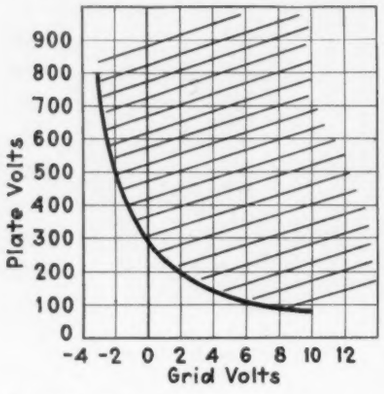
PIONEERS IN PROCESS CONTROL SINCE 1889

side diameter of the conduit and splitting it down the center, making two pieces of it. Each piece was locked into the concrete and into the bottom of cable end-bell to hold it in position.

Electron Tube Tests Commutators

By A. M. HARRISON
Power Division, Westinghouse Electric & Manufacturing Company.

Commutator-roughness of the order of 1/10,000 in., up to a peripheral speed of 10,000 ft. per minute and at temperatures of 100 deg. C. are now being measured in the factory by means of a grid-glow tube. The



Typical characteristic of grid-glow electron tube

method has two outstanding advantages: (1) The maximum commutator roughness is instantly determined by the value of grid voltage at the time the tube glows; (2) because the tube is free of mechanical inertia it follows voltage peaks of practically any frequency. This enables designers to predict more accurately the ability of the structure to remain smooth at operating speed and temperature. Not a single commutator which has passed this brush-drop test has ever failed in service.

In the instrument as developed for practical use the grid-glow tube is supplied with a variable grid voltage which can be varied in steps of one volt from zero to 100 volts. The brush drop is connected in series with this voltage and in opposition to it. When it is desired to measure the peak voltage of a particular brush drop the variable grid voltage is set at some high value and decreased gradually by turning the dials until the glow discharge is obtained and reading noted.

For example, assume the voltage at which the glow discharge took place to be 17 volts. From the curve it can be seen that two volts bias was necessary to just cause the tube to glow; therefore, the peak voltage occurring in the brush drop must be the difference between 17 and 2, or 15 volts. To guard against "drift" of the tube a double-pole switch is used so that one reading can be taken with the brush drop connected and one with the brush drop disconnected. The peak voltage is then the difference between the two readings.

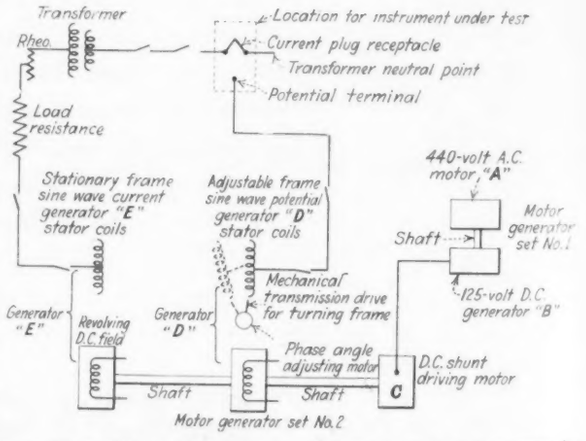
Motor-Generator for Meter Tests

In calibrating standard wattmeters, ammeters, voltmeters, power-factor meters and rotating standards the Western Massachusetts Companies' Springfield laboratory desired to be able to apply a considerable range of voltages, currents, power factors and frequencies to the equipment under test, maintaining the values required within closer limits of accuracy than even high-grade commercial energy circuits furnish. Part of an extensive testing installation worked out by the utility engineers under J. Frank Murray, superintendent of the meter department work of the affiliated companies, and by the engineering department of the General Electric Company's Schenectady factory, solves this problem most effectively.

The general scheme involves the use of two motor-generator sets, one being used for driving the second electrically; the latter has two sine-wave generators mounted on a common shaft, one generator having a stationary frame and the other a rotatable frame. The fixed-frame generator supplies a sine-wave current through a load resistance and transformer to current plug receptacles on the switchboard panel where calibration is done. The adjustable frame generator supplies a sine-wave voltage to potential test terminals on the calibration panel. By shifting the position of the stator coils on this machine with reference to the current coils on the fixed-frame generator, the phase angle between the two generators is varied as required, either by remote control of a small direct-current motor which rotates the frame through a mechanical drive or by hand-wheel turning. The flexibility of the installation is noteworthy.

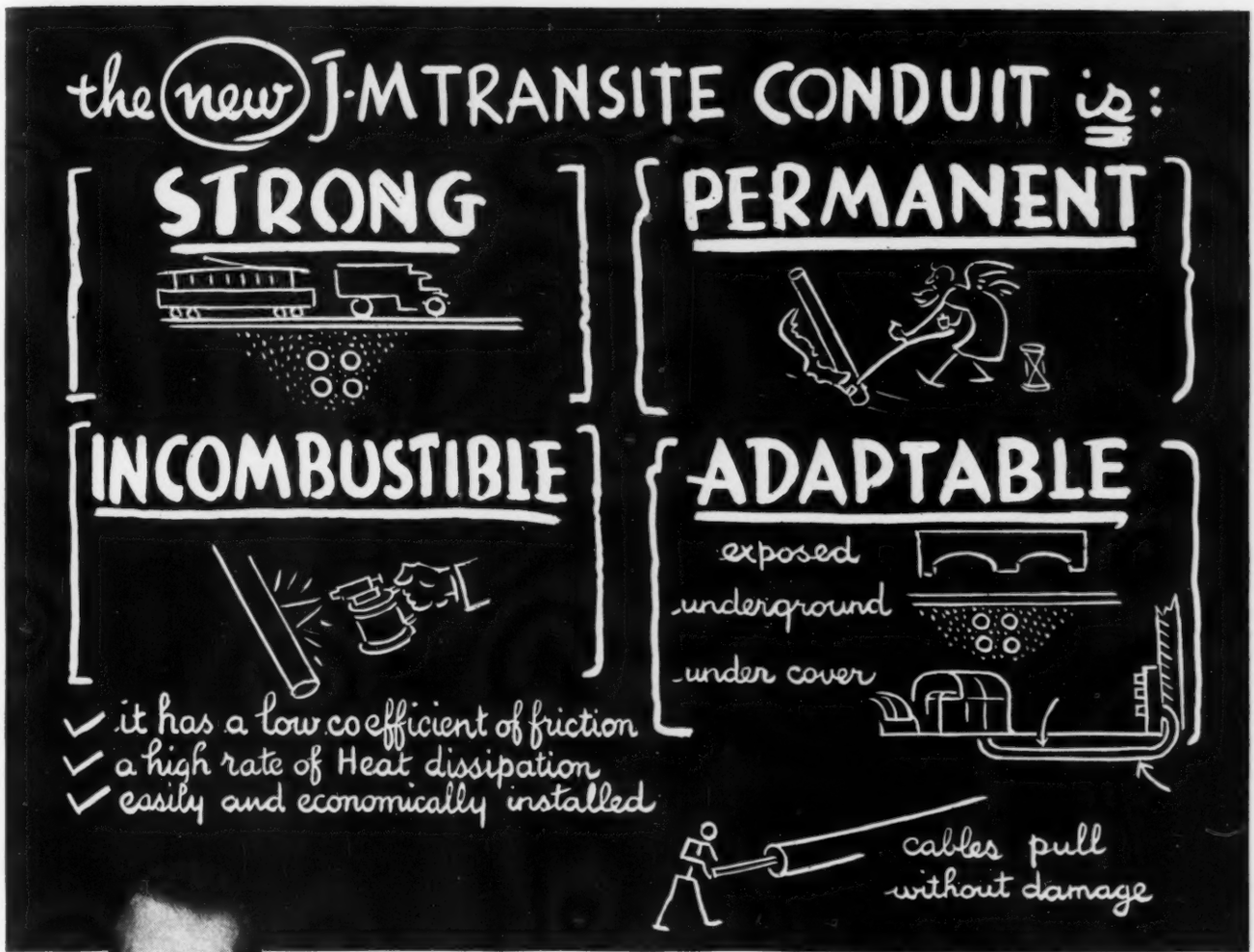
By connecting the stator coils of either generator in series a maximum of 300 volts may be obtained under full excitation and speed and 150 volts maximum with parallel connection under these conditions. The switchboard wiring and switch layouts provide the control with maximum convenience. The frequency of the output of *D* and *E* is varied as required by adjusting the field strength of the driving motor *C*, and the voltage at the terminals of *D* and *E* is varied by adjusting rheostats in their revolving field circuits. The current output of *E* is varied by a load rheostat in series with the generator and the instrument being calibrated, by its field rheostat or by the series-parallel connection of its stator coils. The transformer primary may be operated in either open or closed delta to provide single- or three-phase supply and the secondary windings may be switched in series or parallel as desired.

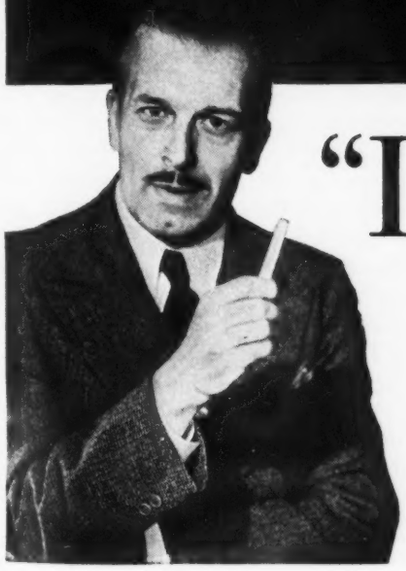
Referring to the diagram, motor *A* is a 30-hp., 440-volt, two-phase, induction machine driving a 21-kw., 125-volt, compound-wound, direct-current generator *B* on the same shaft. The motor is operated off the commercial circuits of the United Electric Light Company at 1,800 r.p.m. and the generator voltage is automatically regulated. This first motor-generator set drives the second by supplying energy to a 7.5-hp., 125-volt, direct-current motor *C*, which in turn drives the testing generators *D* and *E* on a common shaft at from 750 to 1,800 r.p.m. The generators D and E are designed to deliver three-phase energy at their terminals and are rated at 2 to 5 kw. each. They deliver 25 cycles at 750 r.p.m. and 60 cycles at 1,800. By changing the position of the frame in *D* with respect to *E* the power factor may be varied from 0 through 90 deg. lagging or leading.



Arrangement of motor-generator sets for calibrating instruments

No. 1 IN A SERIES OF "CHALK TALKS"





"In Fact, Gentlemen, It's the Ideal Conduit"

• Succeeding "chalk talks" will discuss the characteristics of J-M Transite Conduit in detail. To get the full story at once, mail the coupon for the Transite Conduit Brochure.

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EW-9A-34

Our Operating Problems

[*Continued from page 33*]

interruptions to customers. To solve this problem, one large utility has trained a number of so-called light maintenance and tree-trimming crews whose entire time is devoted to trimming trees, pulling slack, replacing defective pins, crossarms, lightning arresters, fuses and other miscellaneous work that does not require heavy labor. These crews start at substations and work the circuit block by block, doing everything needed in any particular block before going on to the next block. They also make reports on major maintenance items which they are not equipped to handle. These crews are also specially trained in trimming trees and in contacting the public relative to same.

Attention to small towns

The small distribution system in the town of 200 or 300 customers frequently receives scant engineering study. But where there are several hundred of them it has proved most economical to lay out a definitely planned backbone system for five or ten years ahead. Then, as extensions come up, they are systematically fitted right into an ultimate, definite plan.

Safety work, when not just a fad, but a sane, carefully studied and practically carried out program, will pay good dividends.

Standardizing and simplifying meter installations, meter stocks and methods of handling connects and disconnects, as well as intelligent investigations on customers' premises for meter tampering or by-passing, will result in savings that may be surprising to some operating executives. Appliance wiring costs may also be materially reduced by convincing local code authorities that many requirements of their respective codes are unnecessary and increase cost of wiring.

System protection provides a splendid opportunity for high-grade engineering specialists. The necessity of weeding out weak spots in the protective scheme is daily becoming more apparent. The speed with which faults are cleared greatly influences the quality of service rendered, the extent of damages done from power arcs and the stability of the system.

Application of the high-speed type relays will usually yield a handsome return. More kilowatt-hours will be sold as less load is "knocked off" from voltage disturbances during storms, and the disturbances are less severe. The majority of faults originate from conductor to ground and if cleared rapidly enough they do not develop into phase-to-phase short circuits, which cause the greatest voltage disturbances. Maintenance cost will be reduced because of fewer conductor burn-downs, fewer insulator failures and less damage to station equipment. There will be an almost unbelievable increase in tie-line capacities.

The job of adequately protecting a large power system is never finished, requiring continual study of relay performances, short-circuit conditions and assisting the manufacturers in the design of newer and more reliable protective equipment.

Instantaneous clearing of faults, thus reducing permanent line failures, followed by instantaneous reclosing of the feeder breakers, has given hundreds of small towns service over long radial feeders that is comparable to what we previously could have only rendered with dual feeds.

Do accurate metering

With the increased use of interconnections between independent utility systems it becomes more important to know at all times the amount and direction of power flowing past these interconnection points. This brings up the problem of accurate, low-cost, long-distance metering outfits so that readings may be had at load-dispatching points. Experimental work by several different groups over the past year indicate this is approaching solution. Along with this, it is reasonable to expect, will come the practical control of the energy passing the points from the supplying systems' main sources of generation. When, with systems interconnected from Georgia and Alabama to Chicago, it has been necessary to idle 150,000 kw. in steam turbines just to carry the momentary swings between systems it is apparent that real savings can be made by reducing this to even 50,000 kw.

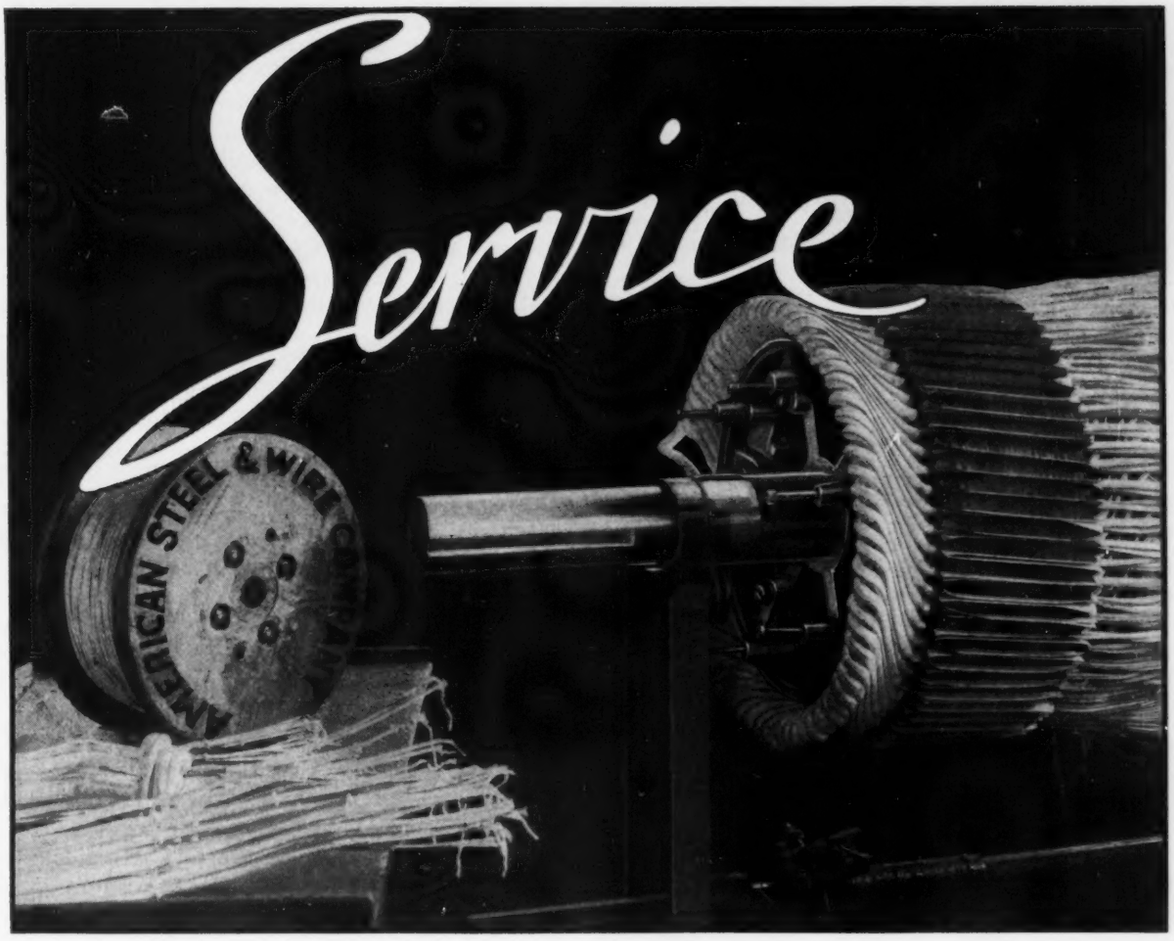
Conservatism and a natural reluctance to changing any system that has been in effect for a long time frequently prevent large savings being made. A careful study of customers' billing, general accounting, cost accounting, statistical records and files will offer many avenues to substantial savings. Almost any large company is making a lot of reports which were valuable when first called for, but which have now lost their usefulness. Correspondence that ought never to have been written is being carefully filed away, occupying valuable building space and the time of file clerks. Cost accounting may be entirely too elaborate. One company saved $40,000 a year by reducing the different number of lot numbers in the stores record from 20,000 to 2,000, with only the normal grumble from the operating man who was charged a nickel for a bolt that he knew should cost 3 cents. Of course, there was no complaint about being charged a nickel for the one worth 7 cents. No one would think of trying to keep individual costs on 200 or 300 street cars, yet many companies are doing that very thing on automobiles.

Study and plan for growth

Careful, systematic study and planning for the system growth will save much money in fixed capital investment. This is particularly important now when it is so difficult to get new money. It does not mean the plan cannot be modified, but it keeps constantly before everybody a definite plan which calls for good reasons before modifying. The work can be speeded up or delayed as needed, but whatever is done is performed as part of a definite whole. Such a plan, prepared six years ago for a large city distribution system, and involving a $10,000,000 ultimate program, has worked wonderfully well. Today only about half the program, instead of the whole, as was anticipated when first planned, has been carried out, but each year as any part is found needed it is built to fit into the general plan.

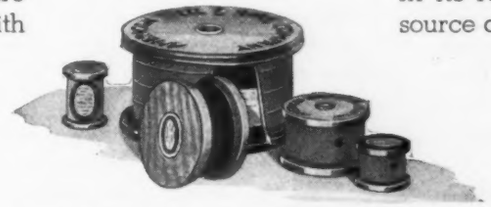
Temporarily, major emphasis may be put on promoting domestic sales through appliances sold both directly and through jobbers and dealers, but the field for commercial and power sales is by no means a closed book. They originally supplied the backlog volume that permitted lowering of domestic rates, and will continue to be a major part of our business. Power, lighting and commercial sales engineers will find a continuing and fertile field for their efforts.

We must operate a little closer, increase the volume of sales, preserve our customers' good will and the respect of the public in general. Well done, it calls for the display of the finest engineering talent, salesmanship and business judgment.



This MAGNET WIRE ASSURES IT

THE word "service." It may refer to the cost of coil windings! The character of performance on the job! Or, it may imply promptness in delivery. In this instance—and in the case of **American Steel & Wire Company Magnet Wire**—the word service is used to specifically convey a full measure of satisfaction in the broadest interpretation of the term. The manufacture of Magnet Wire is a specialty with us. The process of annealing, developed as a result of more than a century of wire making experience, constantly assures uniformity of extreme softness and highest conductivity. At strategically placed warehouses a stock of assorted sizes and shapes, with coverings to meet every need, is always maintained. For service, in its fullest meaning, use this source of supply.



In All Standard Sizes and Constructions

1831

1934

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago
94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION
AND ALL PRINCIPAL CITIES

Empire State Building, New York
First National Bank Building, Baltimore

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco

Export Distributors: United States Steel Products Company, New York

Spend to Save in Maintenance

[*Continued from page 26*]

lights are permanently connected to a secondary service supplied from the feeder. By watching the PILOT LIGHT the troubleman is informed immediately whether or not he has tripped the feeder oil circuit breaker by closing one of the branch lines. If he has he can reopen the branch before the second reclosure of the breaker and thus avert another outage on the feeder.

New technique adopted

Time for putting on climbers and climbing the pole was quite an item where the old style of box type disconnect switch was still in use. Installation of pole top AIR-BREAK SWITCHES at load-center points to replace the older style of disconnects has saved considerable time in restoring service.

As valuable as are DROP-OUT FUSES in expediting service maintenance they are relatively expensive, especially when consideration is given to replacing the great number of the old type with these. So, a conversion gadget (Fig. 7) was worked out with one of the manufacturers, which can be installed at a total cost of about $1 per phase and is equivalent to the new equipment, which costs installed about $8 per phase.

Of many methods of cleaning transformers prior to painting, sand-blasting proved to be best and most economical. Even so, there was still a problem—that of protecting insulator bushings and nameplates. The best way of doing this was removal or covering with rubber, both rather time consuming and expensive. Finally, one of the men decided to try LIQUID RUBBER. After some little experimentation he discovered a very suitable type and consistency. Now all parts to be protected are simply painted over with this rubber. In about 30 minutes it is hard enough for the sand blasting, and after that paint is applied as usual. Then, to finish the job, the rubber film is slit and peeled off, which also removes any paint which formerly would have necessitated careful cleaning.

So far, 40 transformers ranging between 3 and 150 kva. and 2,300 and 33,000 volts have been wholly or partly rewound and are performing satisfactorily in service. All are vacuum-pressure impregnated, as seems to be the best manufacturing practice, and must pass just as rigid tests. Of course, no obsolete types are rewound. Rewinding costs have run between 35 and 80 per cent of the cost of new ones. It is expected that partial rewinding only will be required in about 10 per cent of the cases. From this will come the big savings. Ordinarily these had to be junked, as did many others which could not pass the usual tests.

It was observed that of the DISTRIBUTION TRANSFORMER failures, about 95 per cent of the trouble came from the secondaries. Also, that the primary fuses on these small 6,900-volt transformers being mechanically weak gave some trouble. This led one group of men to experiment with putting excess-current-actuated circuit breakers in the secondary circuit and leaving out the usual primary fuses, primary protection falling back on the master fuses. This gave a high degree of satisfaction. Further along this line another group experimented with oil-immersed, thermal-actuated primary circuit openers instead of the usual fuses. Under load current, and not short-circuit conditions, this performed very successfully.

Fig. 11—Tension equalizer to pull three line wires simultaneously

Transformer covers are often cracked by lightning or when knocked from poles. Formerly replacements were purchased from manufacturers with about six weeks delivery. Now a similar cover is sent to a local foundry and used as a pattern, delivery being given in two days, and at a cost of one-half the usual purchase price. In July, 1934, a saving was made, by so doing, of $15.

An IMPROVED HANGER is now made in the shop by means of a simple bending machine from standard soft steel stock, and with unskilled labor, at about 50 per cent of the factory price (Fig. 8). It is impossible for autos to knock a transformer from a pole where this hanger is used.

The underground crews had been using, for reeling cable, a rig which required the services of four men. A new WINDLASS RIGGING was built (Fig. 9) requiring only two men.

Duct lines will spread and often get out of stack alignment when they are being laid. Concrete DUCT SPACERS with hollows provided for the ducts at proper transverse intervals hold the duct lines in position until the concrete can be poured about them. These spacer blocks (Fig. 10) are cast by troublemen, line gangs and warehouse crews between field assignments.

Pulling line wires individually up to proper tension and sag has been superseded by pulling three wires up at one time. For this purpose a TENSION EQUALIZER was devised (Fig. 11) to bring all three tensions to equal value and hold them there until the wires could be tied.

This company had a surplus of about 15,000 two-wire meters (7,000 to 8,000 in stock, the balance disconnected on customers' premises). All new demand is for three-wire ones, in fact, the regulations specify such. Then this was the predicament: A surplus stock of meters and still having to lay out cash for new ones.

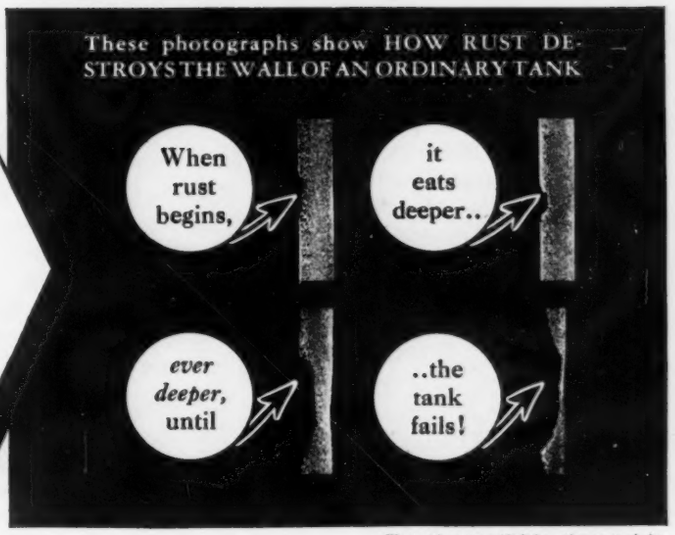
The problem was solved by planning the changes required, making the necessary jigs and setting up a production line in the shop. With such facilities these METERS ARE BEING CONVERTED from two-wire to three-wire, with satisfactory performance characteristics, at about $4 per meter, as compared with the manufacturer's equivalent new meter of about $8.

Also, at the same time, parts are added converting these to the Westinghouse type outdoor meter.

As is generally the case in modern organizations improvements and new developments are the result of joint or multiple effort. Of course, such is the case with the foregoing. However, to add the human touch, it may be of interest to mention the names of the men who directly supervised these accomplishments:

Production—Superintendent E. L. McBee and Roy Shock. System Operation—Superintendent T. J. Nolan and Assistant Superintendent F. H. Dubs. Distribution — Superintendent P. R. Knapp. Line—Superintendent O. T. Rankin and D. Williams. Underground and Transformer—Superintendent A. J. Batchelor. Street Lighting—Superintendent W. E. Salber. Meter—Superintendent J. L. Wright. Accident Prevention—Director R. S. Metzger and Safety Engineer C. E. Vanell.

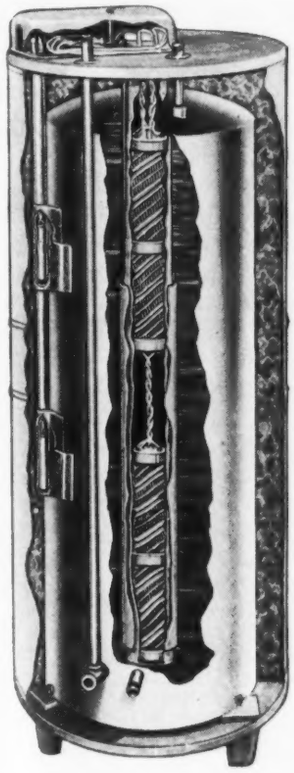
THIS CAN *never* HAPPEN...


These photographs show HOW RUST DESTROYS THE WALL OF AN ORDINARY TANK
When rust begins,
it eats deeper..
ever deeper, until
..the tank fails!

Illustrations magnified three times actual size

IF THE TANK IS

rustless EVERDUR



Cutaway view of Red Crown Duostat Automatic Electric Water Heater with Everdur tank, courtesy Hynes & Cox Electric Corporation, Albany, New York.

- Tanks of Everdur Metal banish rust troubles, because Everdur *cannot* rust. Also . . .
- They give satisfactory service indefinitely . . . cost the buyer far less in the long run.
- They provide dependable consumption of electricity . . . rust cannot interfere with their performance.
- They are available from leading manufacturers, who offer electric heaters equipped with Everdur tanks.

For these significant reasons, more and more utilities are pushing the sale of water heaters with rust-proof tanks. And rust-proof Everdur . . . a high-strength copper alloy . . . is widely favored by leading tank manufacturers. They consider it ideal for the efficient production of rust-proof, welded tanks of exceptional durability . . . because it combines the corrosion-resistance of copper with the strength and welding properties of steel. May we supply additional data and a list of automatic electric heater manufacturers using Everdur tanks?

ANACONDA
from mine to consumer

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Connecticut
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EVERDUR METAL
"Everdur" is a registered trade-mark identifying products of The American Brass Company made from alloys of copper, silicon and other elements.

EVERDUR METAL *for* TANKS

How Industry Electrifies

[*Continued from page 29*]

Some Basic Principles Reaffirmed—Some fundamental principles have been reaffirmed in the crucible test of 1929-1934 which bear reiteration. The sales manager of group B says:

"Power sales engineers frequently weaken their case for purchased power by arbitrarily assuming a rate of depreciation or obsolescence on private plant equipment. It is much better to ascertain the customers' equipment write-off policy. Then costs should be compared, including all operating expenses and fixed charges other than obsolescence. The difference is all the customer will have to write off his investment and many times it will be insufficient, as most industrial write-off rates are 2½ to three years.

"Economic analyses of customers' uses of heat and power in any form with a view to showing him how he can get more for his money constitute one of the best methods of preventing intrusion of isolated plants and develop the good-will of customers. Particular attention should be given to inefficient uses of boilers, steam and other non-electrical processes because most savings can be made there and are usually the chief source of savings claimed for competitive services. If the utility helps the customer effect the savings private plants have little opportunity to enter. There should be no fear of making a customer's plant so efficient that he will consider generation of his own power. Some one will show him anyway. If the utility does so the good will inspired is the best protector of purchased power.

"Such studies are usually confined to customers producing more than $10,000 annual revenue, or regardless of revenue if they are in a position to consider a private plant.

Aiding Customers — Helping customers to solve their production problems, so they can reduce costs, improve quality, increase uniformity, reduce rejects and in other ways gird themselves for the competitive battle that wages and will continue—that is one function which indirectly is bringing utilities added business.

Much industrial equipment is obsolete or so depreciated from past idleness that it will have to be replaced if the organizations expect to evade the ravages of competition. Obsolescence has been brought on rapidly by the great amount of new equipment and new processing developed in the last few years that make machinery and methods, even of 1928, out of date economically.

Consequently, group D contend it is imperative for their power sales engineers to help customers renovize plants so they can meet competition and secure a greater share of the total business. If they don't the customers may lose out in the business struggle and their consumption of power will reduce.

Midget Heaters — The Entering Wedge — Various applications for which electric heat may be used advantageously have been so fully covered in N.E.L.A. serial reports that they will not be repeated. New applications will be brought about by intimate contacts with works managers, metallurgists and process specialists, in co-operation with manufacturers of major equipment used therewith. The chief need to effect adoption quickly is for a widespread dissemination of information on applications to new processes, balance sheets of expense and savings, improvements in production conditions, and the like.

Practically every utility has found that the greatest immediate opportunity for expanding the use of electric heat in industry is through the stimulation of midget heating loads. Great success has been obtained by utilities distributing information on such applications, prepared by manufacturers, to their customers. Projection views showing versatility of applications and benefits are displayed in the offices of works managers, or to groups assembled in utility quarters lighted to show value of modern illumination. The best applications are frequently installed on trial to stimulate others. Kits have been found very effective in demonstrating applicability to different processes.

Last year manufacturers are reported to have sold more than 100,000 kw. in midget heaters.

Air Conditioning Favored—Asked as to where the best market is for air conditioning and how to sell it, practically every utility replied in substance: "C. E. Michel's report in the E.E.I. Bulletin No. B 2, issued May 4, 1934, is our guide." The reader is referred to it for details, but it is important to note that acceptance of the idea differs, depending on whether number of installations or total horsepower is the basis of comparison.

For example, in the industrial field the ranking order of acceptance by number is (1) candy, (2) bakeries, (3) printing and lithographing, (4) miscellaneous, (5) textiles, (6) meat packing, (7) chemicals and drugs, (8) tobacco and cigars. By total horsepower, the ranking order is (1) photographic films, (2) candy, (3) printing and lithographing, (4) chemicals and drugs, (5) meat packing, (6) textiles, (7) citrus-fruit packing. Note that the same five industries appear in this preferred grouping for both classifications.

In the commercial field again there is a difference: By number they rank (1) theaters, (2) restaurants, (3) small stores and shops, (4) office buildings, (5) hotels, (6) banks, (7) department stores. By total horsepower they rank (1) theaters, (2) public buildings, (3) office buildings, (4) department stores, (5) hotels, (6) restaurants, (7) banks. Here the same six applications have high acceptability on either basis.

Lighting Opportunities — Improvement in industrial lighting is more needed than ever before, says group B, because restricted hours of operation and increased labor costs make it necessary to adopt methods which will bring the best return on investment in equipment and labor.

In many places general lighting is below par, but it is believed that concentration on spot lighting affords the best opportunity to stimulate illumination revision where general levels seem sufficient to the management. Besides "plus" lighting is easier to sell because specific operations can be improved which will show up advantageously in contrast with others. Many plants are penalizing themselves with poor lighting, which delays quick set-up of work and tools, repairs, supervision of process and ready adjustments during operations or after interruptions. As many operations, men and machines may be affected by a single weak spot, poor illumination prevents the best use of investment in machines, floor space and man-power.

Speed-of-vision charts have been found to create an interest in lighting among industrial managers. Trial installations of "plus" lighting on one of two operations constitute a cheap method of stimulating more exhaustive rehabilitation by the management.

Load Building Increases

[*Continued from page 30*]

panies say that there was no dealer co-operation in this appliance selling. But seven report that they pay a commission or bonus to dealers on their ranges and water sales, eleven install and service ranges and water heaters sold by the dealers. Dealers are reporting their monthly appliance sales in three cases. Co-operative advertising is featured by 25 companies, eighteen have special co-operative departments or local leagues, five stress the fact that company salesmen receive credit on dealer sales, which takes them out of competition with the dealers, one is now putting seven men on co-operative work, another turned over 6,000 appliance prospects to the dealers during this period.

Gradually the possibilities of dealer development are being realized, but some companies still have not grasped the opportunity. One reports that it pays dealers a commission on range and water heater sales referred to the company by the dealer. Another reports that it gives trade discounts to dealers on sales to them. This is not co-operation, but mere justice. Another says: "Contact only—no wet nursing." Another makes this remark: "It is a dream. There is nothing in it." Apparently they do not yet appreciate what so many other companies are accomplishing through working with the trade.

Installment selling

Clearly, installment selling has become accepted procedure. Only one company states that it does not sell appliances on terms, but there is a wide diversity in practice. On major appliances four companies give time up to eighteen months, 33 companies up to 24 months, two up to 30 months, fifteen up to 36 months, one up to 48 months, and one up to 54 months. The interest charge on 24 months time runs from 6 to 10 per cent, with the majority favoring 10 per cent. On 36 months time the interest charge runs from 8 and 12 to 21 per cent, which is a lot.

Only eight companies selling on terms do not finance themselves, while 21 also finance the local dealers. But three finance the dealers on ranges only, five on ranges and water heaters only, one on water heaters only, one on major appliances only, one only on appliances bought from the company, one only on appliances sold on the company's floor, two "in a limited way" and one in rural territories. But when you remember that the purpose is to build load, that easy payments increase sales, and that after all the credit of the consumer and the dealer is the important consideration, it is hard to understand why these diverse limitations are introduced to restrict the selling. This dealer financing is generally being done at ½ per cent a month.

Cost of wiring

The range is at last receiving more attention as the record shows. Of these companies, fourteen are putting them out on trial, sixteen are paying for the wiring in full or in part and five add a flat charge for wiring to the price of the range. The cost of wiring still varies widely—twelve companies report it between $20 and $30, eight between $31 and $40, seven between $41 and $50 and one between $51 and $75. One company says: "The customer pays time and material plus 20 per cent." Another allows $30 for wiring where competitive fuels are displaced. With two others the customer pays $7.50 to wire from the main switch to the range. With another, where the job costs $37, the customer pays $12, and when the job costs $45 the customer pays $20. Seven companies say they do not sell, while five say they are holding back on ranges to protect gas cooking. In the main, however, the range is standing on its feet these days, sold for the load that it will build, with fewer and fewer of the traditional obstructions standing in its way.

One of the most interesting evidences of the growing pressure behind sales is shown in this report on the number of salesmen that were employed this year compared with last. There were 4,285 salesmen at work this year and 579 home service women, as against 3,596 salesmen and 487 women in 1933. An allowance must be made here for one company that reported 103 men in 1934 and none in 1933, undoubtedly in error, but the contrast is marked. The largest sales staff this year was 647 men and the next 300 men. Thirteen companies reported more than 100, nine companies between 50 and 99 and twelve between 25 and 49. The largest home service staff was 150, the next 55, the next 35 and eleven companies employed between ten and twenty women demonstrators. Six companies had none.

The advertising expenditure shows a marked increase in the first half of this year over the year before, as shown in the tabulation. One company increased its advertising expense 900 per cent, 1 company 500 per cent, three companies 150 per cent, five companies doubled it, one 90 per cent, one 80 per cent, one 75 per cent, two 60 per cent and three 40 per cent. The total by these companies this year was $889,492, against $489,886 last year for the six months. Seven companies spent less in 1934 than in 1933, and one wonders why.

Meanwhile, in part the result of this increased selling activity and in part the better times, there has been an increase in the number of customers of these companies. It is very general—only a few reports show a decrease. The total in 1933 was 9,726,476 and in 1934 it had become 10,033,422.

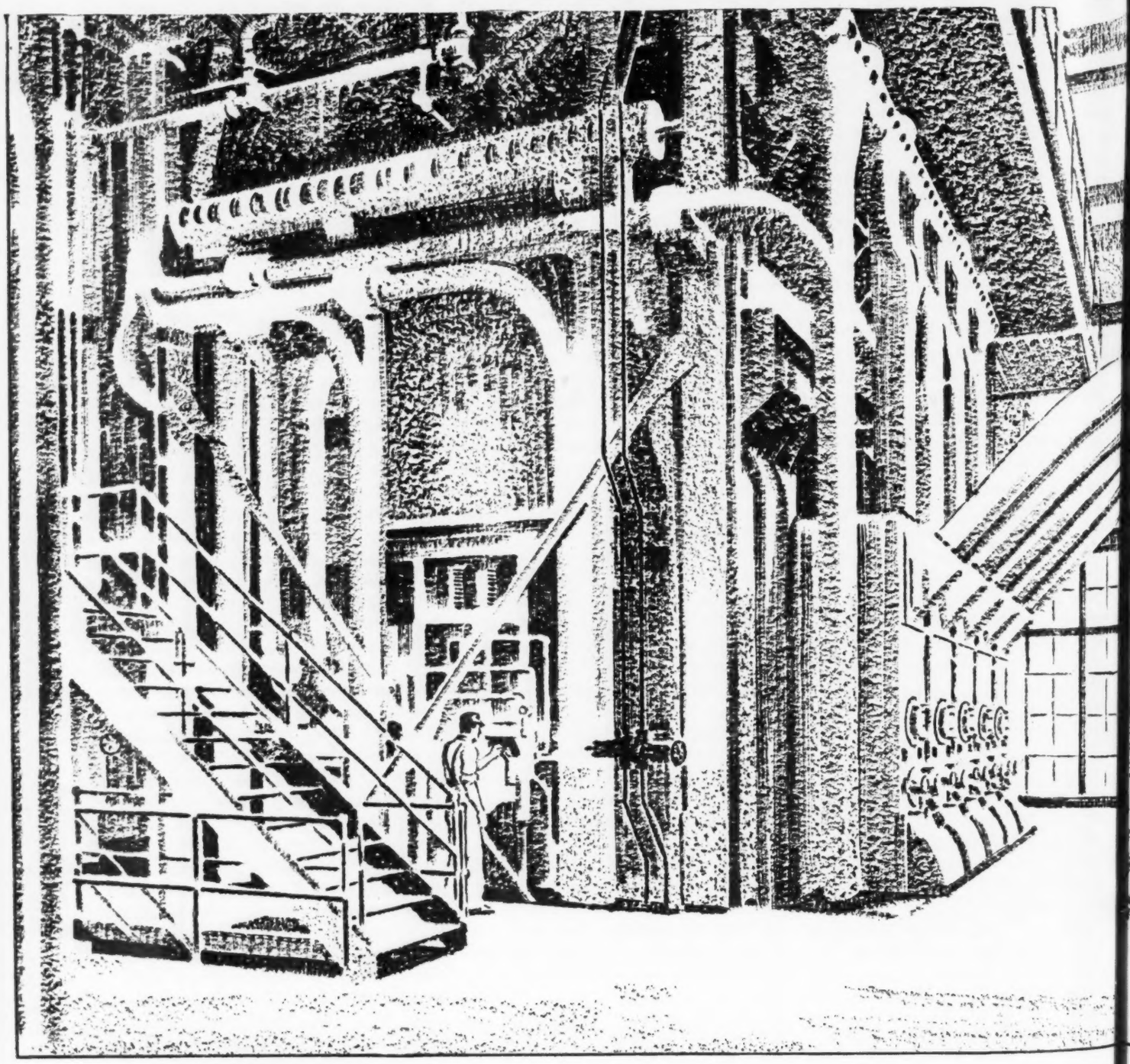
Fall campaigns

So much for the record. How about plans? Apparently there will be a considerably increased activity this fall. Among these companies 42 will push ranges, 34 will drive on water heaters, 30 will campaign refrigerators, 33 will press on lamps, and 22 will feature a general lighting program, in which nine emphasize domestic, six commercial and three industrial. Also thirteen companies will push ironers, fourteen clothes washers, nineteen small appliances, five cleaners, three flatirons, six pumps, two commercial cooking, two radio and one air conditioning.

All this, of course, indicates the present plans and undoubtedly far understates the campaign activity that will develop in these organizations as the season unfolds. One cannot help being struck, however, with the small number of companies that are planning in advance for intensive sales drives and how few appear to be preparing to sell any large number of different appliances by campaign methods. Too often they are left to standard selling activities and normal merchandising. But it is hard to understand why every company should not set up a balanced program that will put pressure behind the full line, each in its season, to put the greatest possible load upon the lines.

But progress is astir and the signs are better. These reports prove it.

To Meet The Challeng



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BOILER UNITS
are complete in every
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Boilers
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Experience
Responsibility
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Service
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and Facilities

BABCOCK

Of The New Order . . .

With the necessity approaching for either the modernization of existing steam-generating systems, to offset the certain higher costs of fuel, or the extension of present generating facilities, to meet the increasing demand on the central station industry for electric power, the public utilities are facing new problems in steam generation that The Babcock & Wilcox Company can help solve.

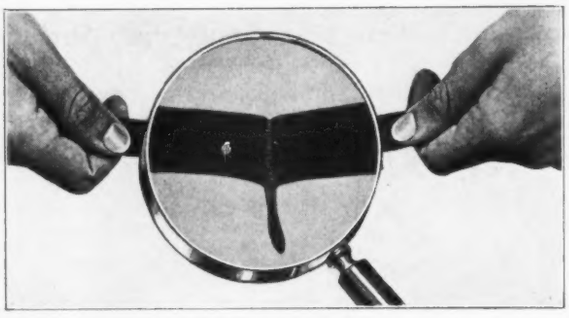
Whether particular problems involve the consideration of new forms of water-cooled furnaces—such as the Bailey Slag-Tap Furnace having a water-cooled floor — the burning of a variety of fuels, the superposing of high-pressure boilers, high-pressure high-temperature units, or even a binary-vapor cycle, the extensive and varied experience of The Babcock & Wilcox Company in the design and application of such equipment together with its wide range of equipment enable it to make impartial recommendations regarding their selection.

B&W Engineers will gladly discuss your problems with you, The Babcock & Wilcox Company, 85 Liberty Street, New York, N. Y.

G50-T

K & WILCOX

BULL DOG FRICTION TAPE



IT STICKS
IT HOLDS
IT LASTS

IT STICKS!

Wherever Bull Dog Tape is applied, the live, viscous surface adheres instantly.

IT HOLDS!

Once stuck to a surface, Bull Dog is true to its name and refuses to let go.

IT LASTS!

Look at the job a year later. The tape is still alive; the joint remains intact.

BOSTON WOVEN HOSE TRADE MARK AND RUBBER COMPANY

BOSTON WOVEN HOSE & RUBBER COMPANY

Cambridge, Mass.

Where We Are Going

[*Continued from page 23*]

near future. The amendments to this act recently passed have softened its difficulties and it may be that, in the long run, the objections to it will disappear. I incline to the view that the bulk of financing in the future will be done by operating companies or by holding companies whose operations are limited to a restricted rather than a scattered territory."

"What do you think of the Rate Survey and the Power Survey now under way?" was another question about a big industry situation that came to mind.

"The industry has nothing to fear from an honest inquiry into a discussion of rates," replied Mr. McCarter. "If, however, the whole undertaking is to be politically colored, it is another question. This industry believes in low rates and gives low rates so far as is possible, but it is not good business and not good policy to lower rates below reasonable earning levels simply because of agitation and clamor. This industry is now selling aggressively and expanding its business, and this is the method it has used always to improve service and lower rates. Despite present low rates, utility markets are so large and so unsaturated that a great growth is in store and one that will permit of maintaining past records for steadily lower rates and improving service."

"What do you think can be done by the Edison Electric Institute to improve its effectiveness?" This final question was a little unfair, but served to bring out the steps taken already and also the personal views of Mr. McCarter.

"As I have said," replied Mr. McCarter, "a committee has been appointed to study possibilities, and until it reports I do not care to comment upon E.E.I. activities to any extent. My personal view is that the work of the institute in the future should in general be more active in two respects: (1) In its internal service to the industry through committee work and the dissemination and interchange of information, and (2) in its external service, such as relations with the government, the press, finance, taxes and the public. This organization is needed and is doing good work. It is building soundly and well and its services will be improved."

No opinions so fatally mislead as those that are not wholly wrong, as no watches so effectually deceive the wearer as those that are sometimes right.

PUBLISHED in the interest of adherence to proved engineering principles by The Superheater Company and The Air Preheater Corporation, 60 East 42nd Street, New York, which continue to maintain their high standards, since no business is accepted on terms that would force altering them slightly to eke out a profit margin.

Perhaps a few shortcuts in engineering would not wholly destroy the effectiveness of our products and would enhance their competitive position, but opposed to the instances where they would suffice would be many more where the customer must lose. Unless the customer profits, the supplier cannot profit.

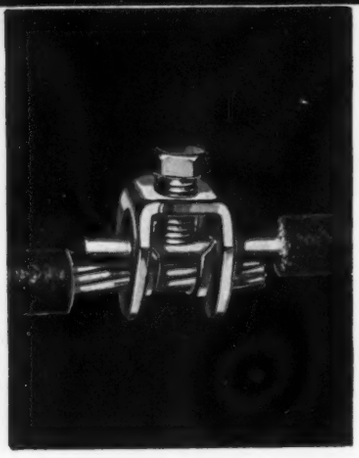
Business is built on mutuality of profit.

A-860

SUPERHEATERS • AIR PREHEATERS • GRIFFIN HOT BLAST • WATER WALLS • ECONOMIZERS

Reliable

SERVICE ENTRANCE CONNECTORS



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Dependable Lasting . . .

Saves time . . lowers costs

TAKE advantage now of a new, low-priced connector that provides further economy in secondary distribution.

This device is of one piece and is easily installed. You get a permanent joint that won't vibrate loose.

There are no sharp edges to nick wire. Made entirely of high strength bronze—97% copper.

Will take any combination of 6 or 8 B&S solid or strand. Sold in standard packages of 100.

Write for a sample.

Send for Sample

Reliable Electric Company

3145 Carroll Ave., Chicago

Distributed by GraybaR ELECTRIC COMPANY OFFICES IN ALL PRINCIPAL CITIES

Utilities Must Add Capacity

[*Continued from page 22*]

to building a single large station. One large property states that it appears economical to build steam or Diesel stations at intervals on the outskirts of large cities. On transmission properties the plan favored is to build stations at load centers on the transmission line or at intervals of from 50 to 100 miles.

The majority of engineers appear to be very skeptical of direct generation at voltages in excess of 33,000, and some doubt the merit and economy of generation above 13,000. Two reasons are given. It is claimed that it is cheaper to use transformers or auto-transformers in generator leads to step up the voltage as contrasted to direct generation. It is also said that the protection of high-voltage generation against lightning and other disturbances is not yet perfected.

Very strong influences on new station design are the cost of future money and the rate of depreciation allowed or required by commissions, the effect of amortization financing on write-off of the investment and the influence of the labor situation. The threat of labor trouble or high labor costs is apt to force the adoption of complete automatic stations despite their higher first cost.

When asked how close operations were to present capacity limits, assuming normal reserves, a variety of replies were received. One large property said it was not up to its loading limit, others said they were now adding needed capacity, another large system said loadings were within 10 to 20 per cent of present capacity. Other replies showed loadings of 85, 60, 90, 70, 75, 60, 65, 80, 50, 60, 80 and 85 per cent of limits. It is evident that a variable condition exists, and this is borne out by replies to the question as to when new capacity would be needed in operations. Typical replies were: Within two years, one or two years, three to five years, at end of three years, in 1937, in 1936, in 1937, in fall of 1937, in spring of 1935, now adding 80,000, now adding 160,000, now adding 10,000, cannot guess. Here again conditions are variable, but the conclusions are that (1) new capacity in volume is expected to be necessary in 1936, 1937 and 1938, (2) negotiations for the purchase of new capacity will begin at least a year previous to the date capacity is needed.

The Wagner Net-Work

of 25 factory branches is your assurance - - -

that wherever your customers may be located, there is a Wagner service branch and a staff of motor experts nearby — whether in Maine or Oregon, in Minnesota or Texas.

When selecting a make of motor, it is very important to give consideration to the service the motor manufacturer can give your customers. It makes your sales story much stronger and more convincing when you can point to definite plans you have for nation-wide handling of motor service or application problems — *for when your customers need replacal motors or repair parts, they usually want them without delay.*

Twenty-five branches, like those illustrated here, carry a complete stock of standard motor parts, available for immediate shipment.

When you select Wagner, you add the entire Wagner organization to your own.

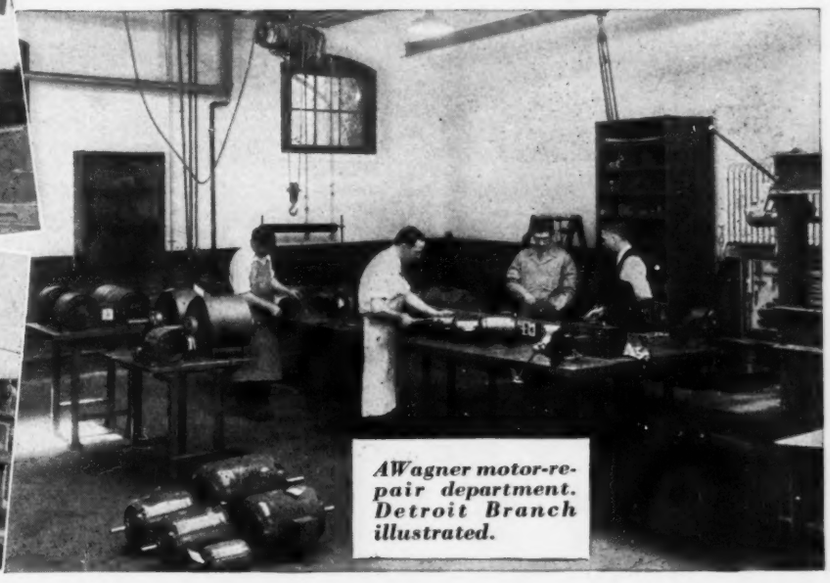
Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, U.S.A.

Motors Transformers Fans Brakes

M134-1

25 FACTORY BRANCHES

ATLANTA	CINCINNATI	INDIANAPOLIS	MINNEAPOLIS	PORTLAND
BALTIMORE	CLEVELAND	KANSAS CITY	NEW YORK	SAN FRANCISCO
BOSTON	DALLAS	LOS ANGELES	OMAHA	SEATTLE
BUFFALO	DENVER	MEMPHIS	PHILADELPHIA	ST. LOUIS
CHICAGO	DETROIT	MILWAUKEE	PITTSBURGH	TORONTO



AWagner motor-repair department. Detroit Branch illustrated.

EMERGENCY ENGINES FOR ANTICIPATED 20 to 30 YEARS of SERVICE Should be Built Like

Sterling High Duty

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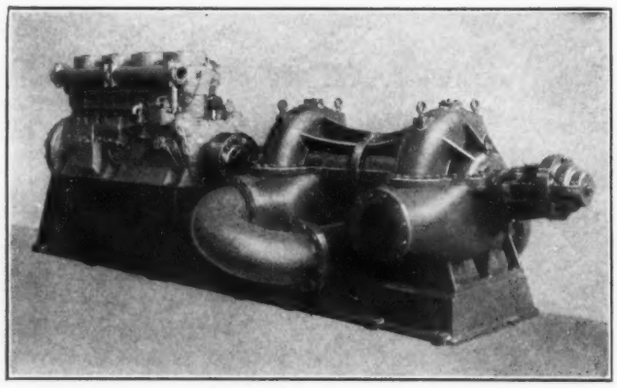
THE ENGINE OF REFINEMENT

Internal Combustion Engines

A free booklet will show you the essential features you ought to know when buying engines.



For Utilities Commission, Elizabeth City, N. C., has a Dolphin 8 cyl. 300 H.P. Sterling engine direct connected to a 10" 2 stage double suction Morris Cent. pump.

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Home Office and Plant
1270 Niagara St.,
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Dept. C-2

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900 Chrysler Bldg.,
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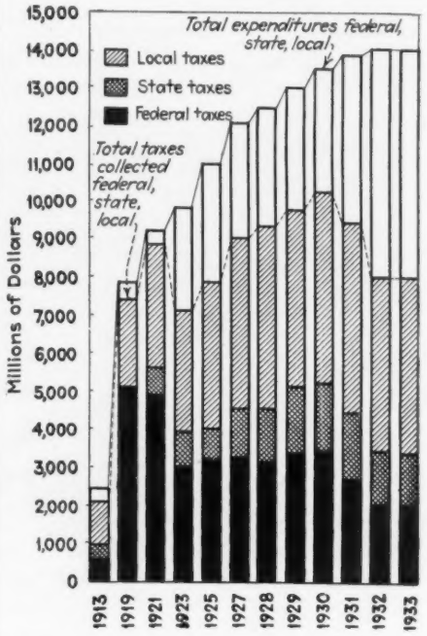
Government Taxes and Expenditures

An interesting balance sheet on national expenditures and on national income was presented by George Spalding of the Mountain States Telephone & Telegraph Company in a recent broadcast. The accompanying chart shows all tax collections, estimates for 1932 and 1933 and all



Excess of expenditures over income steadily increases for the nation.

expenditures by national, state and local agencies. It will be noted that the striking feature of the chart is the magnitude of local taxation and the accumulation of floating debt. In 1923 the difference between expenditures and income was $3,000,000,000 and in 1933 this had increased to $6,000,000,000. Obviously 1934 will show an even greater unbalance between expenditures and receipts.

This floating debt has been funded and now appears as an enormous sum—it is true inflation. Already it strikes hard for payment. Mark Graves recently stated in *Bond Buyer*: "2,361 units of government organization, including municipalities, counties and smaller political units, had defaulted in payment of the principle or interest on their loans prior to June, 1934—an increase of 600 since the first of the year." With this national balance sheet, is there any economic reason for government to enter the utility or any other business?

LIGHT

..yet it wont *spring, break or slip*

ELECTRICAL WORKERS, PARTICULARLY LINEMEN, HAVE PUT THEIR UNQUALIFIED APPROVAL ON THE CRESTOLOY WRENCH

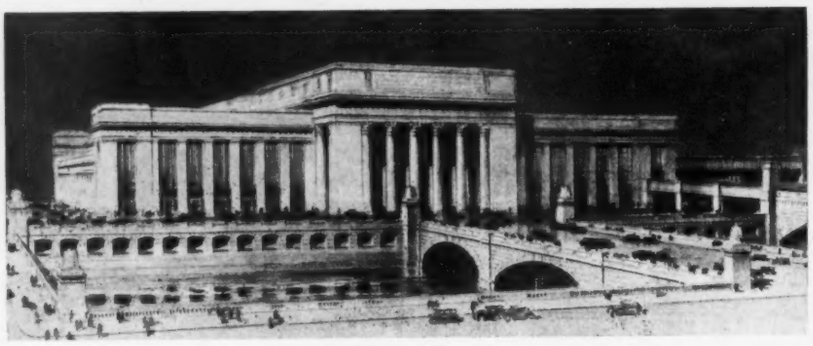
This tool, with its 30 percent thinner jaws, is 200 percent stronger than ordinary wrenches. It is light and easy to carry in the lineman's belt; it is safe because it will not *spring* and *slip* under severe service conditions. It's a time-saver for the mechanic and a money-saver for the management.

Crestoloy Wrenches are available in both single and double end patterns. Single end wrenches range in size from 4 to 15 inches, priced from $1.00 to $3.00. All are finished in heavy chrome-plate, providing extreme resistance to rust. Ask your supply house or write for the Crescent Catalog.

CRESCENT TOOL CO.
Jamestown, N. Y.

CRESTOLOY STEEL WRENCH

DESIGNED, MADE AND GUARANTEED BY THE ORIGINATORS OF THE CRESCENT WRENCH



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NEW, MAGNIFICENT PENNA. R. R.
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used extensively in
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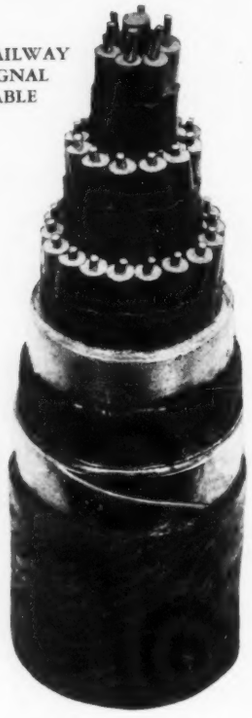

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FLAME RETARDING SAFE COTE MOISTURE RESISTING

All kinds of Special Wires and Cables for Signals, Radios, Annunciator Systems, Bridges, etc., where highest uniform quality and longest life are essential.

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"Forty-Five Years of Knowing How"

CRESCENT INSULATED WIRE & CABLE CO., INC.

TRENTON, NEW JERSEY

LETTERS TO THE EDITOR

Electrodes for Water Heating

To the Editor of ELECTRICAL WORLD:

In connection with the article "Electrode Elements Used in 3,000-Watt Heaters," by Fred Clayton, on page 173 of the ELECTRICAL WORLD for August 11, 1934, some of your readers may be interested in certain design data and comments on the danger of explosion in this type of heater. This information is derived entirely from an article entitled "The A.C. Electrolysis of Water," by J. W. Shiplet, in the *Canadian Journal of Research* for October, 1929, page 305.

It is well known that when current flows through water between two electrodes there is a tendency to generate hydrogen and oxygen in proportions of 2:1, which mixture is highly explosive. The above-mentioned article, after citing several instances of serious explosions resulting from the use of such heaters and discussing the possibilities of using vents to remove these gases, gives an exhaustive study of the effect of using electrodes of various materials and possibilities of eliminating the generation of gases by using low current densities on the surfaces of the electrodes. Each material used in the electrodes has a "critical value" of current density, below which gases are not produced in dangerous quantities. For commercial installations, this author recommends the use of iron or steel electrodes, with a current density not to exceed 0.75 amp. per square inch.

This article also discusses the shape of the electrodes, calling attention to the fact that current density is high around sharp projections on the electrode surface, and therefore the tendency to form gases is greater in these localities. Therefore concentric cylinders are recommended as the best shape for the electrodes, with non-conducting waterproof material to cover the ends.

With these facts in mind, it should be possible to design efficient, low-cost heaters of this type. Possibly the eventual disintegration of the electrodes is one of the most serious disadvantages.

BUEL MCNEIL,
Chicago, Ill.

Light Output Efficiency

To the Editor of ELECTRICAL WORLD:

Through error the following statement was made in ELECTRICAL WORLD on July 21 in connection with our new No. 1005

A SILK OR RAYON STOCKING holds its shape by the threads being correctly treated. This treatment is known as "setting the twist," and is accomplished by electric heat and CHROMEL heating elements. Thus Chromel contributes its bit to the charm of womanhood; provides electric heat for industry and home; and Chromel created and sustains your heating load, with its profitable revenue . . . a revenue not available till the discovery of Chromel in 1900. . . a discovery which left to the civilized world a legacy of electric heat. . . For technical data, send for Catalog-WJ.

HOSKINS MFG. CO
DETROIT, MICH.

HOSKINS
CHROMEL
WIRE
The Wire that made Electric Heat possible

Crapo
GALVANIZED PRODUCTS

INDIANA STEEL & WIRE CO. Crapo Galvanizing MUNCIE, IND.

Proved in the Crucible of Actual Performance

Crapo Galvanized Steel Strand long ago demonstrated its ability to stand up under punishment in the most vulnerable spots.

That is why leading engineers now specify it exclusively for the toughest jobs. They know from actual service records that its *pure zinc* galvanized coating resists corrosion long after others fail; that it has a consequent longer life; and, that its use reduces maintenance costs.

Insist upon genuine *Crapo* Galvanized Steel Strand for all new and replacement work! It more than meets the most rigid specifications.

Indiana Steel & Wire Company
Muncie, - - Indiana

Steel Strand
• • •
Telephone and Telegraph Wire

Crapo Galvanized Steel Strand "on the job" at Fairmont Car Barns of Monongohela West Penn Public Service Company.

Whitall Tatum
TRANSPARENT INSULATORS

Used for years on telephone, telegraph, railroad and lighting company distribution lines . . . . . a dependable source of supply for uniform, well-designed transparent glass insulators. . . . . . .

WHITALL TATUM COMPANY
Glass Manufacturers Since 1836
225 Varick Street - NEW YORK

Flood-Lite: "Electrical Testing Laboratories' tests show 87 per cent light output." This statement, confusing results obtainable with two different items of equipment, is not correct and we wish to indicate the correct light output efficiency as 61.5 per cent.

JIM SHIRREFFS,
President,
S & M Lamp Company,
Los Angeles, Calif.

Laws of Supply and Demand

To the Editor of ELECTRICAL WORLD:

It is customary to speak of "the law of supply and demand" without stating it by formula or otherwise, which is contrary to what we do about any other law. In many text books on economics the action of supply and demand is stated in a manner contrary to common experience, which is one reason for the widespread distrust of economic theory. The following is a tentative suggestion which needs checking as to details, but which will be recognized as agreeing with everyday experience.

Numerous attempts have been made to draw parallels between economic facts and those of physics, which is entirely proper, since both deal with manifestations of energy and its transformations. The human elements in the long run do not contradict this statement, but only cause local uncertainties, just as it is now understood the molecules of matter do. Instead of using the physical laws of water pressure, as has been done for so many years, let us state formulas parallel to those of Ohm's law for electric currents.

Electrical Term	Analogous Economic Term
Volt	Demand Intensity
Ohm	Price
Ampere	Rate of sales
Watt	Productivity
$I = E/R$	(1) Rate of sales = Demand/Price
$R = E^2/W$	(2) Price = (Demand)^2/Productivity
$W = I^2R$	(3) Productivity = (Rate of Sales)^2 × Price
$I = \sqrt{W/R}$	(4) Rate of sales = $\sqrt{\text{Productivity/Price}}$

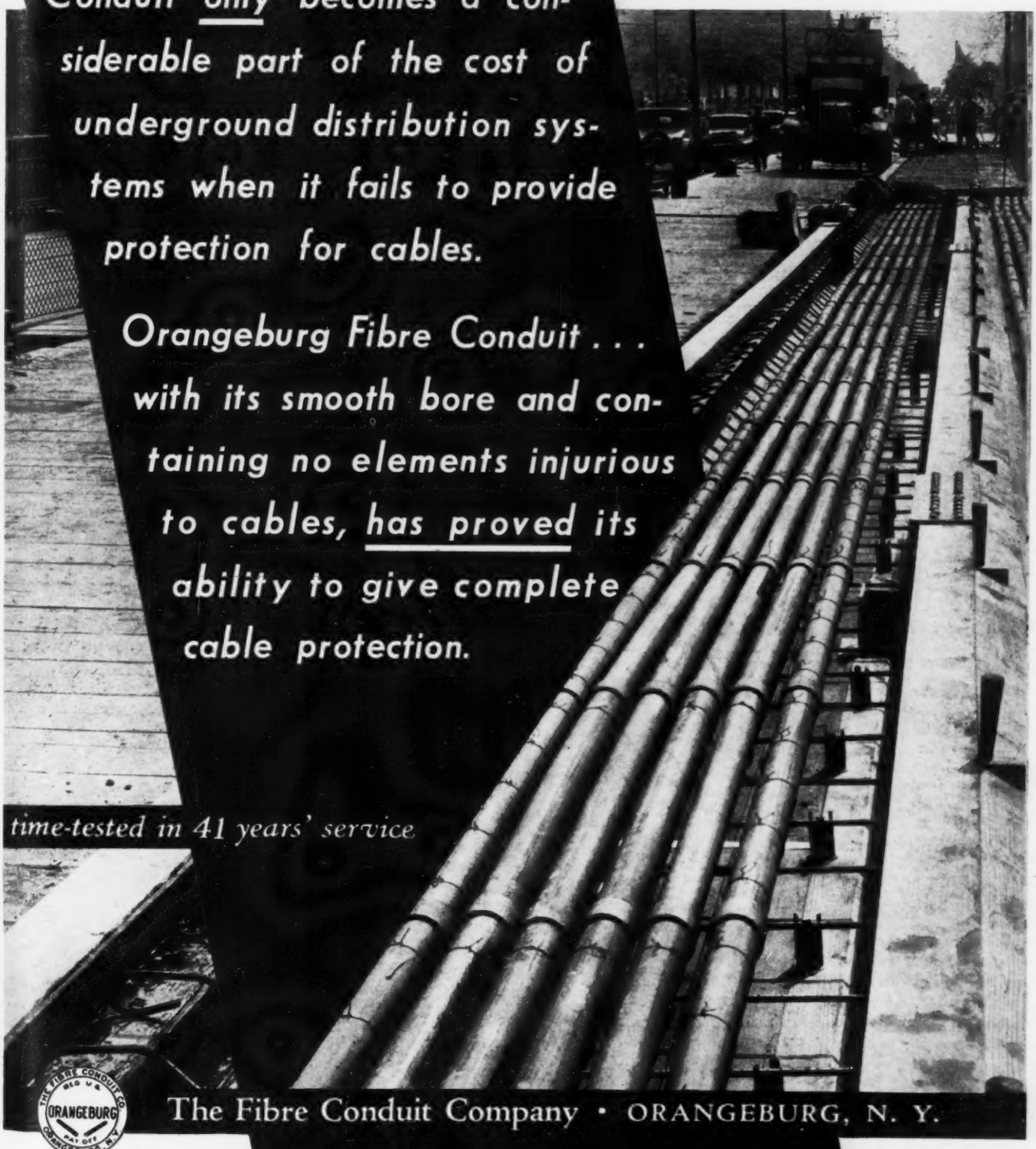
Formula (2) indicates that profiteering is a natural law which can be curbed only by increasing productivity and not by prohibition or by reduced production. It also indicates that if prices are to be raised a slight change in demand has far more effect than a change in productivity. Formula (4) indicates that overproduction also follows a natural law and can be curbed by an embargo on movement of goods or else lowering of prices. In both of these instances it would seem that the U. S. Government at the present time is moving contrary to these natural laws and is bound to come to grief unless its methods are changed.

WM. F. TURNBULL,
Tuckahoe, N. Y.

ORANGEBURG FIBRE CONDUIT

Conduit only becomes a considerable part of the cost of underground distribution systems when it fails to provide protection for cables.

Orangeburg Fibre Conduit . . . with its smooth bore and containing no elements injurious to cables, has proved its ability to give complete cable protection.



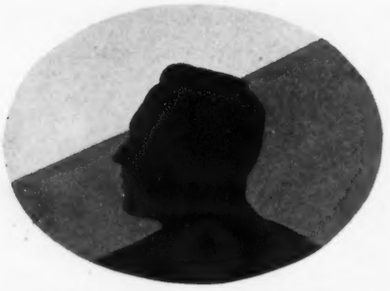
time-tested in 41 years' service

The Fibre Conduit Company • ORANGEBURG, N. Y.

SALES AGENTS

GENERAL ELECTRIC SUPPLY CORP.

GRAYBAR ELECTRIC COMPANY



MEN OF THE INDUSTRY

R. D. Donaldson Assumes Broader Managerial Duties

Roderick D. Donaldson, vice-president of the Utility Management Corporation, has recently been appointed Management representative for all Southern property groups in the Associated Gas & Electric

System. Following graduation from Cornell University in 1907, Mr. Donaldson obtained his early experience with Consolidated Gas, Electric Light & Power Company of Baltimore and with the Potomac Electric Power Company in Washington, D. C.

From 1910 until 1918 he was power engineer with the United Gas Improvement Company, leaving to enter military service. After the war he entered the consulting engineering field and conducted an organization bearing his name specializing in industrial power plant economy and electric utility problems. It was in 1925 that Mr. Donaldson joined the Utility Management Corporation as assistant chief engineer, subsequently being elected to a vice-presidency. At the present time Mr. Donaldson is also a vice-president of the Florida Public Service Company.

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▶ WALTER C. BECKJORD, vice-president and general manager of the Boston Consolidated Gas Company, has resigned to become a vice-president of the Columbia Gas & Electric Company with headquarters in New York City. He will assume his new duties during September. Mr. Beckjord went to Boston in 1930 from the American Light & Traction Company, New York, where he was a vice-president. He will be succeeded in Boston by E. M. Farnsworth, Jr., formerly with Stone & Webster, Inc.

▶ A. C. ROY has been appointed manager of the advertising division of the air-conditioning department of the General Electric Company to succeed W. A. Bowe, resigned. Mr. Roy entered the employ of the Edison Lamp Works of the General Electric Company in 1916 and was transferred to Nela Park, Cleveland, when the Edison and National Lamp divisions of the company were merged in 1930. In 1932 he was transferred to the air-conditioning department. Mr. Roy will continue to have his office in New York.

▶ HAMILTON H. ROBERTS has organized a new lighting sales company under the name of H. H. Roberts & Company, Inc., covering the New York metropolitan area and surrounding territories, with headquarters in New York City. Mr. Roberts will direct the affairs of the company in the capacity of president. For the past ten years he has been New York sales manager of the Wheeler Reflector Company. The new company will operate the New York office of certain national manufacturers of lighting equipment whose combined lines will cover the complete lighting field.

▶ THORNDIKE SAVILLE, professor of hydraulic and sanitary engineering at New York University, has been appointed executive engineer in immediate charge of the water resources investigations of the National Resources Board, according to an announcement made by Public Works Administrator Harold L. Ickes. Studies of public water supply, power, irrigation, flood control and navigation will be included in the investigation. Mr. Saville will be in immediate charge and will co-ordinate the activities of the consultants, engineers and economists to be employed on the project.

A. R. Schiller Directs Twin State Operations

Avery R. Schiller, vice-president in charge of operations of the Public Service Company of New Hampshire with offices at Manchester, has been elected a vice-president of the Twin State Gas & Electric Company to assume operation of the properties of that company which are located in the State of New Hampshire.

A native of Spokane, Wash., and a graduate of Harvard University, Mr. Schiller started his business career with Stone & Webster in 1912. After discharge from the United States Army in 1919, he became associated with the consulting engineering firm of John A. Stevens of Lowell, Mass., remaining there until January 1, 1924, when he became assistant to the president of the Manchester Traction, Light & Power Company with offices in Manchester.

In 1926, upon the formation of the Public Service Company of New Hampshire and the taking over by that company of the Manchester Traction, Light & Power Company and several other electric and gas utilities in the state, he was made vice-president in charge of operations. Mr. Schiller will continue in that capacity with the New Hampshire properties in addition to assuming his new duties with the Twin State Gas & Electric Company.

OBITUARY

▶ CHARLES HENRY HINDS, a pioneer inventor associated with early incandescent lighting equipment for theatrical service and in auditoriums, died at his home in Somerville, Mass., August 18, after a short illness. He was born in Boston 95 years ago and in later life was engaged in government service for some years. He retired about 30 years ago.

▶ C. PETER CLARK, formerly chief of the rate and tariff bureau of the Massachusetts Department of Public Utilities, died at his summer home in South Wellfleet, Mass., August 22. He was born in Jamaica Plain, Mass., 75 years ago and was president of the Old Colony Railroad, a subsidiary of the New Haven system, at the time of his death. He retired from the commission's service in 1928.

▶ GEORGE W. CHRISTOPH, founder and president of the Sterling Blower Company and Hartford Blower Company, both of Hartford, Conn., died at the Hartford Hospital August 20, after an extended illness. He was born at Reading, Pa., in 1863 and had been located in Hartford for about 40 years, having previously been connected with the New York Exhaust & Blow Pipe Company.

▶ F. THOMAS TURNER, well known in the electrical contracting business in Chicago for the past fifteen years, died recently after a month's illness. He was 48 years of age. At the time of his death Mr. Turner was identified with the Line Material Company, South Milwaukee, Wis. He formerly had served as special representative of the Union Metal Company of Canton, Ohio, and more recently had spent five years with the General Electric Company.

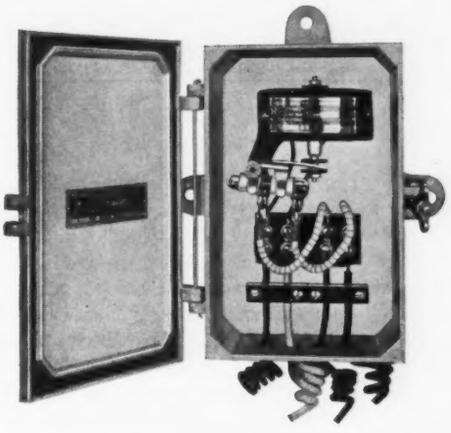
▶ J. K. MACCARTHY, since 1928 a district manager for Kelvinator Corporation, died suddenly at his home in Raleigh, N. C., August 14. Mr. MacCarthy was 37 years old. He had been continuously associated with the sale of electrical products for the past 21 years, having entered the electrical industry with his own appliance shop at the age of 16. In 1926, after having served as a Kelvinator distributor and a farm lighting equipment salesman, Mr. MacCarthy was selected by Kelvinator to fill a field representative vacancy with a district office in Raleigh. Two years later he was made a district manager, covering Raleigh and Greenville, N. C., and Columbia and Charleston, S. C. Last year Norfolk and Richmond, Va., were added to his territory.

DIAMOND H SWITCHES

MERCURY TUBE RELAYS

FOR

MULTIPLE STREET LIGHTING



WEATHERPROOF CASE

30 Amperes, 125 volts
20 Amperes, 250 volts
A.C. or D.C.

The advantages of relay control for multiple street lighting systems as compared to series systems is arousing much interest among electric lighting companies.

We have developed a new relay with mercury tube make and break, built in a cast Aluminum weatherproof case that performs this service, is dependable for long continuous operation and is reasonable in cost.

These mercury tube relays have been used on street lighting systems for some time and their performance carefully checked. The results have been exceptionally satisfactory to the company using them.

From a close study of the relative merits of the multiple system with relay control versus the series system, three definite advantages are apparent in the multiple system.

1. **Reliable**—One light or a group of lights may be operated by this relay. Contacts are positive. Coils are designed for continuous duty and are free from burn outs under normal conditions.
2. **Safe**—This system is fed from a low potential secondary (120 volts) circuit from the distribution transformer.
3. **Economy**—Actual use over a period of time has shown savings of approximately 25% in operating and maintaining the multiple system over the series system.

Not less than 80 volts are required to operate the relay to open circuit position. Thus it is not affected by stray direct currents from trolley lines.

These relays can be mounted either on the pole or located in the base of an ornamental street light. They are used generally for the control of 120 volt street lighting lamps.

HART MANUFACTURING COMPANY, HARTFORD, CONN.

DIAMOND H SWITCHES

FOR BULLETIN—*Mail this Coupon*

Hart Mfg. Co.
Hartford, Conn.

Please send by return mail Bulletin No. 15 on Mercury Tube Relays to

Name .....

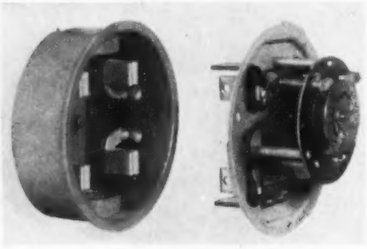
Company .....

Address .....

NEW EQUIPMENT

Time Switch for Off-Peak Control of Water Heaters

Socket-mounted time switch for the off-peak control of water heaters adapted to outdoor as well as indoor installation has been announced by the General Electric Company. This type T-11S switch can be plugged in to a standard socket meter



General Electric

base. Used in combination with standard outdoor or indoor metering devices, it is protected by a glass cover and sealed to the socket meter base into which it is plugged. As supplied, however, it does not include the socket base, glass cover or sealing ring, these being standard meter parts.

The time-keeping element is the Telechron motor. Contacts of silver, to handle 20 amp. at 230 volts, are slow-opening, positive-break for a.c. circuits only. They are operated directly from the 20-hour dial of the Telechron motor.

•

High-Speed Photo-Electric Lock-In Controllers

Electronic industrial control devices for initiating a control function from an actuating impulse as brief as 1/5,000 of a second have been announced by the Westinghouse Electric & Manufacturing Company. These devices are photo-electric, high-speed, lock-in controllers.

Some of the applications are: Photo-electric control application; limit or flag switch; determining and counting; current or voltage control applications; resistance-control applications and contact control applications.

Each of the four "Photo-Trollers" comprises a panel assembly upon which are mounted the tube sockets, transformers, resistors and other accessory parts inclosed in a distinctive crinkle-finished cabinet which has several knockout positions for conduit. Convenient terminals are provided for all electrical connections. The panel assembly may be easily removed for servicing the equipment. Simple adjustments are provided for setting the sensitivity.

•

Manual Regulator for Alternating Current

A "Kathetron" manual regulator for alternating current only has been introduced by the Roller-Smith Company, New York. It has applications for any alternating-current circuit where it is desired to manipulate voltage, wherever alternating-current rheostats, resistances, reactances, multi-step transformers and similar apparatus are now used.

In one form the anode-cathode terminals are connected to the secondary of an impedance transformer by which the length of time that the secondary of the impedance transformer is short-circuited by the path through the Kathetron is varied and the current permitted to flow to the load varied to correspond. In another form the regulator is supplied so as either to boost or reduce the voltage applied from line to load over a range of about 50 per cent each way. Ratings range from 1 kva., 120 volts to 100 kva., 2,400 volts, with regulation percentages from 25 to 150.

•

THE NORGE CORPORATION, Detroit, Mich., has announced the addition of a chest type refrigerator, model T-20, to be known as the "Norgette." This model is brought out to make "Rollator" refrigeration available for summer homes, offices, apartment kitchenettes, roadside stands where limited use does not require a full-size model. The specifications are 2 cu.ft. net storage space, porcelain top, lacquer sides and front, full porcelain interior.

Automatic Motor Starters of Across-the-Line Type

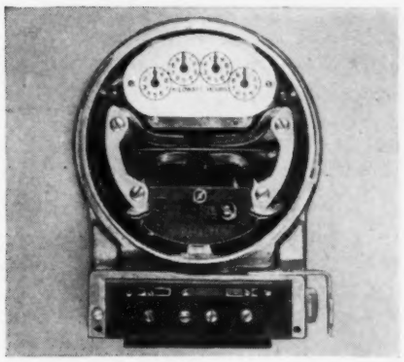
Automatic motor starters which positively prevent accidental starting and which permit taking full advantage of the motor's capacity without danger of burning it out are announced by the Lincoln Electric Company, Cleveland, Ohio. This starter is of the across-the-line type and fully meets underwriters' requirements.

It is impossible to close the starting switch unintentionally due to the design of the control. The red stop button extends around and beyond the green start button. Consequently, a bump or fall against the control would move only the stop button. Once the motor is stopped the only way it can be restarted is by pressing the recessed start button with the fingertip. Full advantage of the motor's capacity is permitted by an inverse time-limit protection which allows carrying a small overload a long time or

Lincoln Electric

very heavy load a short time. Immediate motor starting upon resumption of current is insured by low-voltage release with two-wire control.

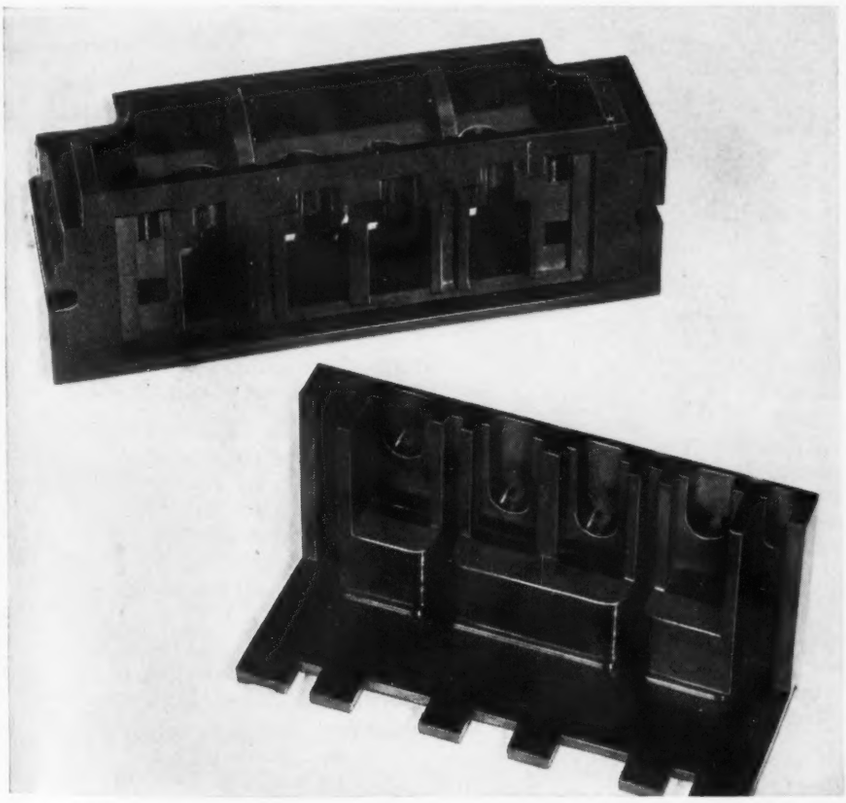
The new starters are furnished in three types for different horsepowers and 110, 220, 440 and 550 volts. The XLA starter is for 3 and 5-hp. motors, 110 volts; also 3, 5, 7½ and 10 hp., 220, 440 and



New Watthour Meter

interchangeable terminal blocks are of Bakelite Molded . . . .

FOR THE GREATER convenience of their customers, four leading meter manufacturers have cooperated in developing an advanced type of Watthour meter with parts interchangeable between makes. Among the greatly improved and vital parts are the terminal blocks all of which are formed of Bakelite Molded.



These blocks required high insulation value, strength, resistance to moisture and temperature variations, and precise dimensions in all parts of their rather intricate design. Bakelite Molded was the choice of the cooperating engineers because it possesses all of the properties and advantages which were demanded.

This case is indicative of the acceptance of Bakelite Molded by experienced electrical manufacturers for insulation parts that must be relied upon to retain their efficiency unimpaired through long service.

We believe that there are many types of electrical apparatus and equipment where the use of Bakelite Molded would prove to be both economical and advantageous. We would be glad to cooperate with manufacturers and electrical engineers in the adaptation of our materials to their particular requirements. We also would be glad to mail a copy of our illustrated booklet 3M, "Bakelite Molded" on request.

(Left) Standardized Bakelite Molded interchangeable terminal blocks as used in the meters described. Courtesy of Sangamo Electric Co., Springfield, Ill. (Above) "A" type Sangamo Standard Watthour Meter.

BAKELITE CORPORATION, 247 Park Avenue, New York, N.Y. . . . . 43 East Ohio Street, Chicago, Ill.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

BAKELITE

REGISTERED U. S. PAT. OFF.

"The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" in the numerical sign for infinity, or unlimited quantity, it symbolizes the infinite number of present and future uses of Bakelite Corporation's products"

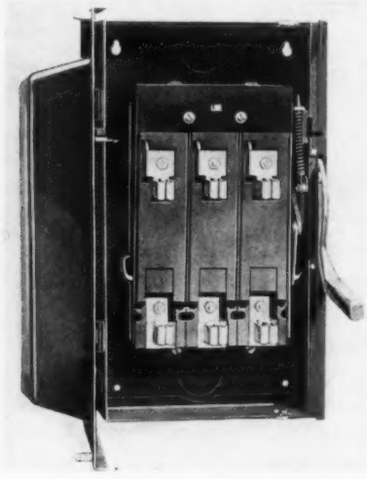
THE MATERIAL OF A THOUSAND USES

550 volts. The XLB starter is for 7½ and 10 hp., 110 volts; 15, 20, 25 and 30 hp., 220 volts; 15, 20 and 25 hp., 440 volts, and 15 and 20 hp., 550 volts. The XLBB is for 30 hp., 440 volts and 25 and 30 hp., 550 volts.

•

100- and 200-Amp. Switches Now Available

Addition of 100- and 200-amp. switches to its 50,000 line of type A switches has been announced by the Square D Company, Detroit, Mich. This completes the line up to and including 200-amp.



Square D

switches in either standard sheet metal boxes or cast aluminum inclosures, with cast iron inclosures optional, if specified. The 100- and 200-amp. numbers have all the features of the line, with some added points necessitated by the higher capacities. They are quick-make, quick-break, with interlocked covers and elevated removable bases for easier wiring. The inclosures are consideraby smaller than those of the conventional type of knife switch due to the compact design of the interiors. Among other features are double-break contacts with steel spring reinforcements and assuring constant pressure on the contacts for reduced heating and positive pressure contacts.

The entire line now includes 230 volts a.c., 250 volts d.c. and 575 volts a.c., 600 volts d.c. switches in two or three poles, three-wire solid neutral and four-wire solid neutral, fusible and not fusible.

•

POLARIS MODEL TM 19 HOTPOINT TIME-CLOCK with telechron electric movement has been announced by the Edison General Electric Appliance Co., Inc., Chicago. It is fully automatic, with two dials for on and off control of current for oven or appliances. It is furnished with a three-conductor cord and plug that fits any Hotpoint range timer receptacle.

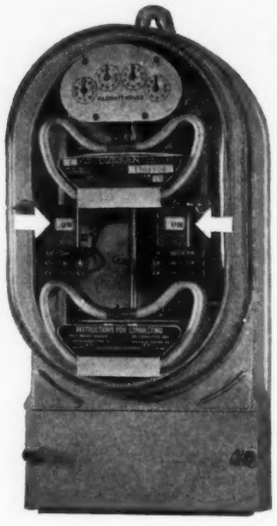
Air Conditioner for Passenger Elevator

To provide a free circulation of air in many closed passenger elevator cars an air conditioner for that purpose has been developed by the Warner Elevator Manufacturing Company, Cincinnati, Ohio. It is called the Warner "Fan-Light." Made for installation in the ceiling of the elevator car, this no-draft fan light gives a soft, even light and at the same time provides perfect air conditioning.

•

Watt-hour Meter Design

Watt-hour meter design known as the MF for both single phase and polyphase has been announced by the Duncan Electric Company, Lafayette, Ind. The single-phase line contains the new A and S interchangeable types and also the B and C standardized styles. Improvements incorporated in the MF line include the "Micro-set" full-load and light-load adjustments, high efficiency and separable electromagnets, lower potential loss, interchangeability of elements and other parts, and freedom from bearing adjustments. A substantial reduction in the weight of all models has been achieved



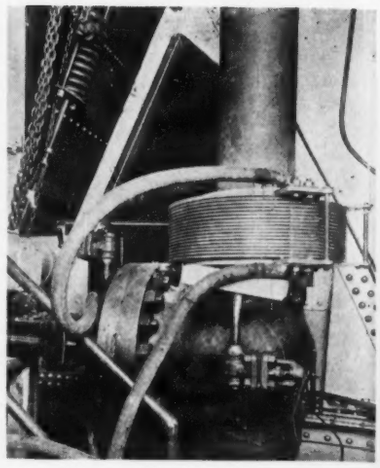
Duncan Electric

by efficient space engineering and use of new materials. All polyphase models feature new style electro-mechanical potential indicators.

•

Electric Weld Stress Reliever for Pipes

An electric weld stress reliever for pipes ranging from 6 to 24 in. has been announced by the Detroit Electric Furnace Company, Detroit, Mich. The equipment has been designed for normalizing welded joints in pressure piping systems and is especially useful for field operation, in the opinion of the manufacturers. Jointed rings of various



Detroit Electric Furnace

sizes are provided to fit pipes of diameters described. Power is supplied for a special transformer which, with necessary control equipment, is mounted on a hand truck for ease of field operation. Induction heat is applied to the areas to be relieved in accordance with predetermined values. Speed, cleanliness and precise control are claimed as outstanding advantages for the equipment.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

DESK LAMPS—A 24-page guide has been published by Marks Manufacturing Company, Chicago. It describes 50 different types of bed, clamp lamps and desk lamps for home and office.

WATT-HOUR METERS—Three new bulletins describe the new line of watt-hour meters made by Duncan Electric Company, Lafayette, Ind. No. 150, a new metering program; No. 151, type MF meter, and No. 152, MF-S detachable meters, cover all information on the new lines.

VULC-ON RUBBER-TIRED WHEELS—A four-page booklet on its newly introduced line for industrial trucks has just been issued by the B. F. Goodrich Company, Akron, Ohio, and is now available upon request to the manufacturer. The booklet points out the many advantages of Vulc-On rubber tired industrial wheels as compared to the obsolete steel wheels on equipment already in service, gives data concerning comparative tests between rubber tired and steel wheels. Savings possible by use of rubber tired wheels is pointed out and sizes and specifications, as well as wheel numbers to be used as guides when ordering Vulc-On wheels, are included.

THIS IS YOU

REPUBLIC SIL-CON

Reg. U.S.Pat.Off.

PERFECTED ELECTRICAL STEELS...SHEET AND STRIP

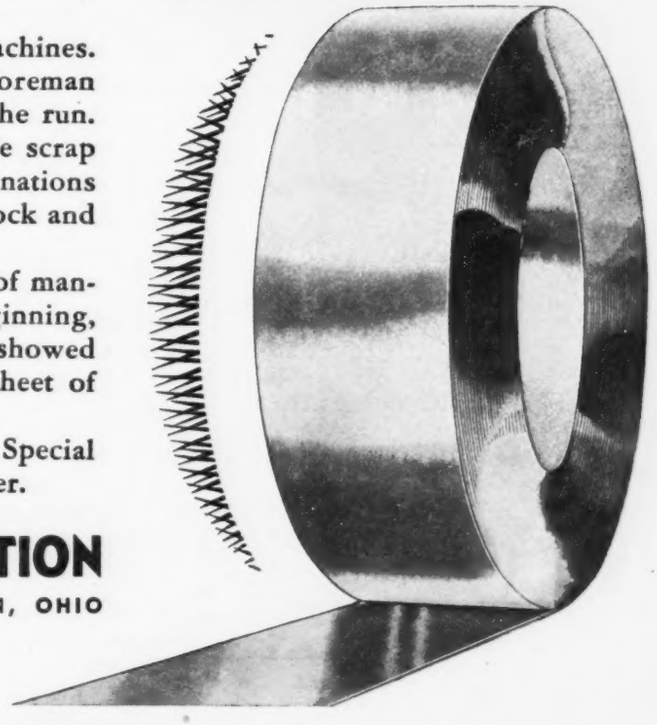
Right now you are doing what this man is doing—reading about a finer grade of electrical steel—Sil-con.

And perhaps you are wondering just how much better it is than the steel you are using. There's only one way to find out. Try it.

Put a coil of Sil-con Strip on one of your machines. Watch production speed up. Ask the die shop foreman to examine the die for wear before and after the run. Note the absence of loose scale. See how little scrap loss there is. Watch how easily the flat laminations stack. Then take a completed unit to the test block and compare electrical performance.

This procedure has sold Sil-con to dozens of manufacturers who, frankly, were sceptical at the beginning, but who, after the test, realized that Sil-con Strip showed the same electrical performance as the finest sheet of equivalent grade.

Made in five grades—Armature, Electrical, Special Motor, Special Dynamo and Regular Transformer.

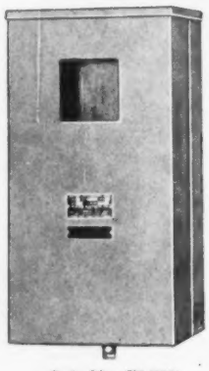


REPUBLIC STEEL CORPORATION

GENERAL OFFICES YOUNGSTOWN, OHIO

Licensed under patents 1,867,818; 1,932,306 to 1,932,309 inclusive; and other patents applied for.

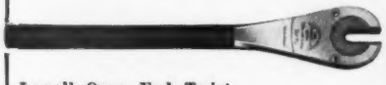
Walker Weatherproof Outdoor Polyphase Cabinets



Cat. No. W-200

A WALKER Weather-Tight Cabinet for every purpose. The above Cabinet is for Polyphase Meters constructed of copper bearing rust resisting steel. Galvanized after fabrication. Any arrangement of knockouts or threaded hubs. Fitted with wood back board, plenty of space for wiring and test block. Modern in design and attractive in appearance. Send for catalog showing our complete line of Outdoor, Indoor, and Metering Transformer Cabinets.

Walker Electrical Company
Atlanta, Georgia



Lowell Open End Twisters for copper only.

Inexpensive

TRY *before you* **BUY**

Write for the Lowell 15 day trial offer before you buy line splicing tools . . .

LOWELL WRENCH CO.
Worcester *Mass.*

Easily handled

Lowell "Clamping Type" Twisters for A. C. S. R. and Copper.

Send for Circular "B"

SALES OPPORTUNITIES IN NEW CONSTRUCTION

Spot coverage of the week. Projects approved and proposed, bids requested, equipment wanted, funds available. Prospects for the electrical manufacturer.

LOCKPORT, N. Y.—Has preliminary plans for city-owned hydro-electric generating station on Eighteen-Mile Creek, capacity about 4,400 kw., for street-lighting and waterworks service, etc. Estimated cost about $908,000, with transmission line. Financing proposed through federal aid. Louis A. Harding, Prudential Building, Buffalo, N. Y., is engineer.

DUBUQUE, IOWA—Dubuque Packing Company plans installation of motors and controls, conveyors, etc., in new two-story addition to meat-packing plant. Cost about $100,000, with equipment.

WASHINGTON, D. C.—Quartermaster Depot, United States Army, asks bids until September 5 for 165 gasoline-electric generating sets, 5 kw. each (Circular 42).

CŒUR D'ALENE, IDAHO—Plans city-owned electric light and power plant, using Diesel engine-generating units, and electrical distribution system. Fund of $650,000 has been secured through federal aid for this and extensions in municipal waterworks.

SPRINGFIELD, ILL.—Asks bids until September 17 for electrical instruments and other equipment for city-owned electric light and power plant. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

GREENSBORO, N. C.—Bogle-Watkins, Inc., recently organized, plans installation of motors and controls, regulators, conveyors and other equipment in new multi-unit knitting mill. Cost about $150,000.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, receives bids until October 8 for two 66,000-hp. vertical shaft, plate steel spiral scroll case, single runner hydraulic turbines for Norris Dam power plant, and for one 45,000-hp vertical shaft, concrete spiral case, single automatically adjusted propeller type runner hydraulic turbine for Wheeler power plant.

CHILLICOTHE, OHIO—Is considering new city-owned electric light and power plant. Cost about $770,000, with transmission line. Financing proposed through federal aid.

PENSACOLA, FLA. — Spearman Brewing Company has plans for new multi-story brewery. Cost about $200,000, with equipment. Richard Griesser, 64 West Randolph Street, Chicago, Ill., is consulting engineer.

HARTFORD, WIS.—Asks bids until September 4 for one 750-kw. turbo-generator unit, automatic extraction type, with surface condenser, air cooler, and accessories, for city-owned electric light and power plant. Jerry Donohue Engineering Company, Sheboygan, Wis., is consulting engineer.

NORTH MANKATO, MINN.—Soon takes bids for equipment for new city-owned electric light and power plant, and electrical distribution system.

PHILADELPHIA, PA.—Bureau of Supplies and Accounts, Navy Department, Washington, D. C., asks bids until September 4 for 100,000 ft. high-tension cable for Philadelphia Navy Yard (Schedule 3177).

KANSAS CITY, MO.—United States Division Engineer, Missouri River Division, Postal Telegraph Building, receives bids until September 11 for 30 portable electric air heaters for Fort Peck dredges.

DECATUR, ALA.—Is having plans drawn for new city-owned electric power plant. Fund of $350,000 has been secured through federal aid.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, asks bids until September 25 for electric power plant machinery outfits complete for Eastern Navy Yards (Schedule 3166).

PITTSBURGH, PA. — International Silver & Gold Corporation plans installation of motors and controls, conveyors, electric hoists and other equipment for development of silver mining properties and new milling plant. Financing for $312,500 has been authorized, majority of fund to be used for purpose noted.

SAGINAW, MICH.—Banner Brewing Company, Fritz Goebel, president, recently organized, plans new local multi-unit brewery. Financing for $395,000 is under way, large part of fund to be used for new plant and equipment.

BOSTON, MASS. — United States Engineer Office, Custom House, receives bids until September 6 for lighting systems on two new highway bridges over Cape Cod Canal, work including about 70,000 pounds of steel (Circular 6).

LONGVIEW, WASH.—Weyerhaeuser Timber Company plans installation of motors and controls, conveyors, loaders, etc., in new addition to pulp mill. Cost over $85,000, with equipment.

WASHINGTON, D. C.—General Purchasing Officer, Panama Canal, Washington, asks bids until September 7 for lighting and power cable, rubber insulated cable, magnet wire, copper wire, rigid steel conduit, etc. (Schedule 2990).